THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXXVIII. No. 2167.] LONDON, NOVEMBER 22, 1904. [56TH YEAR. PRICE 6d.

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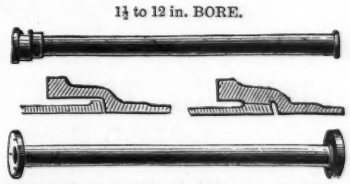

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Saves its Cost many times each Year.

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WRITE FOR FULL PARTICULARS.

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1000 CANDLE POWER AT 1d. PER HOUR.

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It is particularly adapted for Engineering Works, Foundries, Breweries, Dye Works, Collieries, Brick Works, and all large Shops and Spaces.

Will save 50 per cent. on Lighting Bill where either Electric Light or Gas are in use.

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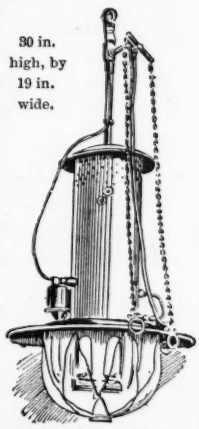

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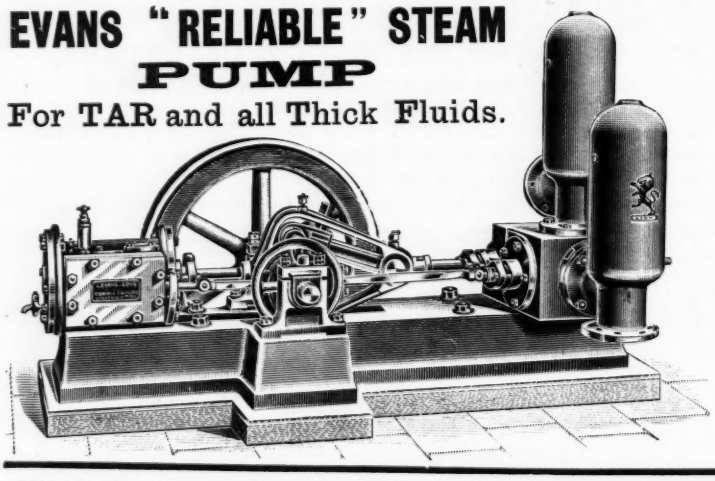

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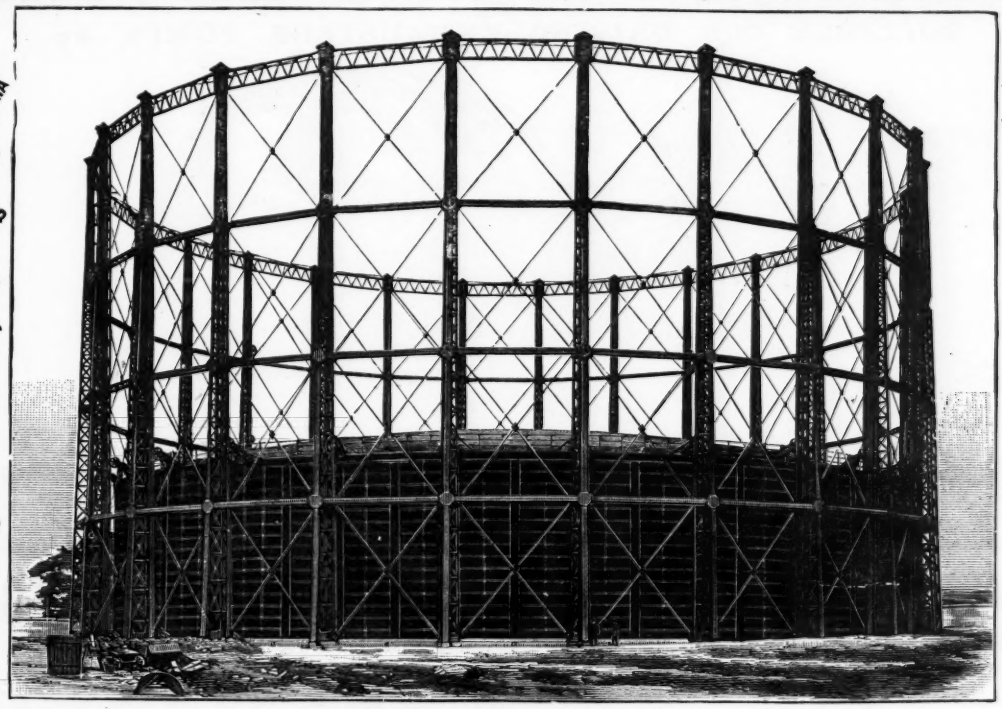

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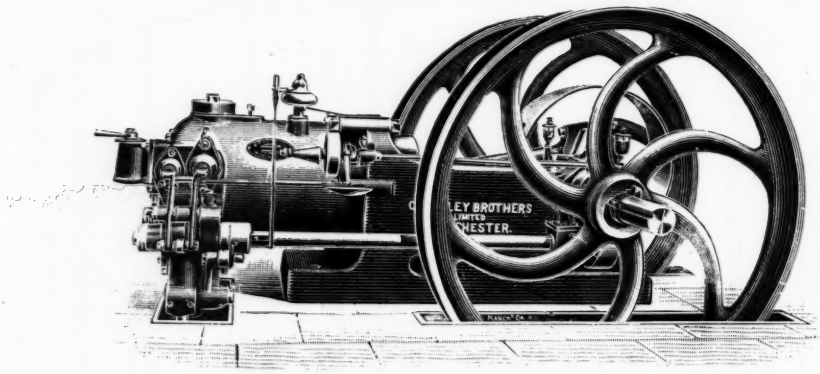

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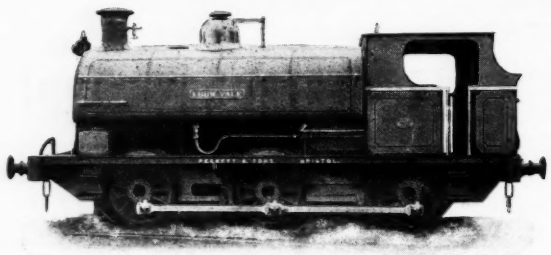

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The Welsbach Kern (Patent)

Self-Intensifying Lamps.

Length overall.
604a 2 ft. 8 in.
604b 3 ft. 3 in.
604c 4 ft. 2 in.

Width overall.
Reflectors.
Enamelled. Opal.
604a 16½ in. 18 in.
604b 22 in. 24 in.
604c 24 in. 26 in.

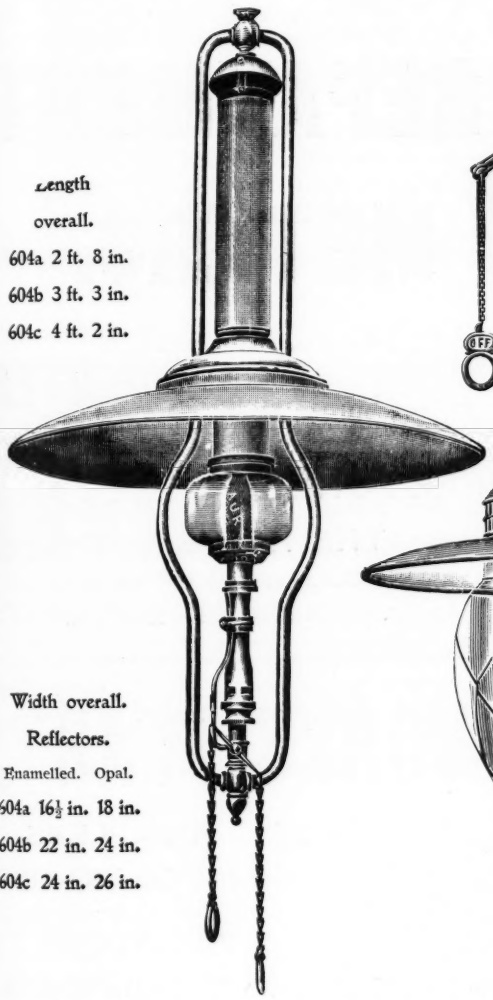


Fig. 604.

Interior Lighting.	Enamelled.	
A 5 ft. per hour,	150 c.p.,	£1 13 0
B 10 ft. „	300 c.p.,	2 8 0
C 20 ft. „	600 c.p.,	4 4 0

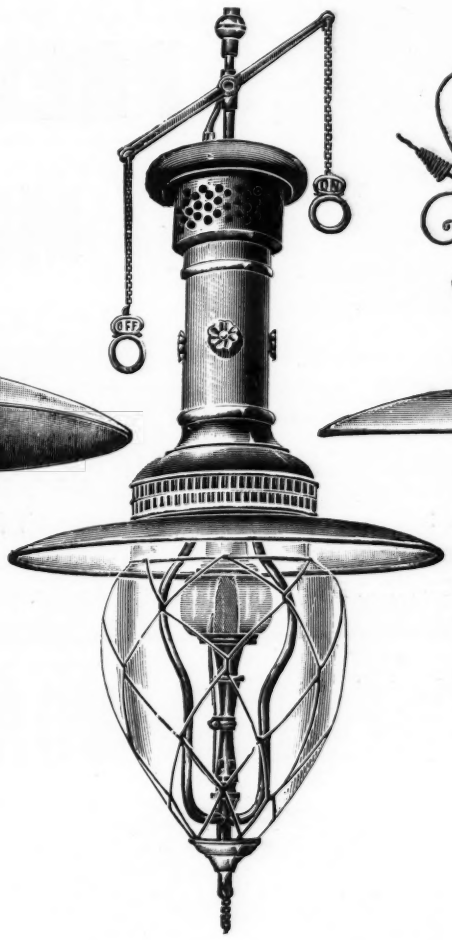
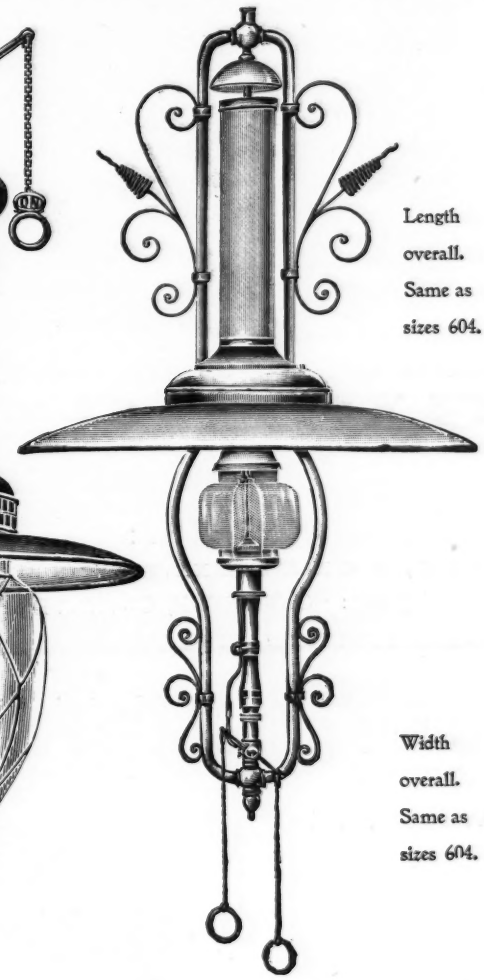


Fig. 607.

Overall.	Length.	Width.
607b	4 ft. 4 in.	24 in.
607c	5 ft. 0 in.	29 in.

Storm Proof Arc. Enamelled Reflector, Cup and Ball Joint, Lever Tap and By-pass.

607b 10 ft. per hour,	300 c.p.	£5 0 0
607c 20 ft. „	600 c.p.	7 10 0



Length overall. Same as sizes 604.

Width overall. Same as sizes 604.

Fig. 605.

Interior Lighting (Ornamental).		
605a 5 ft. per hour,	150 c.p.,	£2 5 0
605b 10 ft. „	300 c.p.,	3 16
605c 20 ft. „	600 c.p.,	5 0 0

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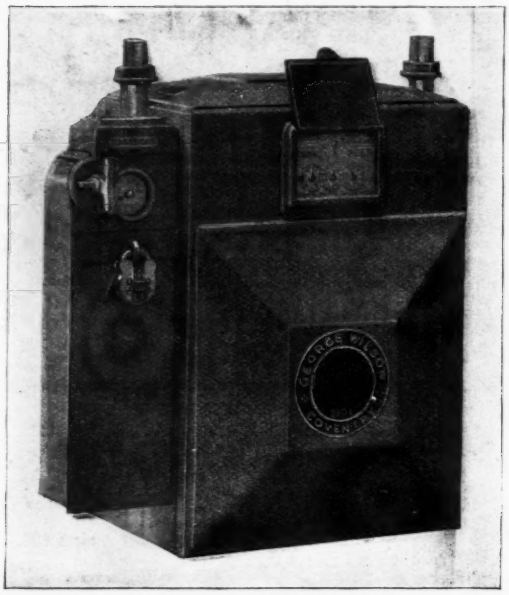

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An Inverted . .
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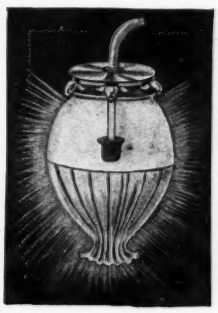

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No Lighting Back.

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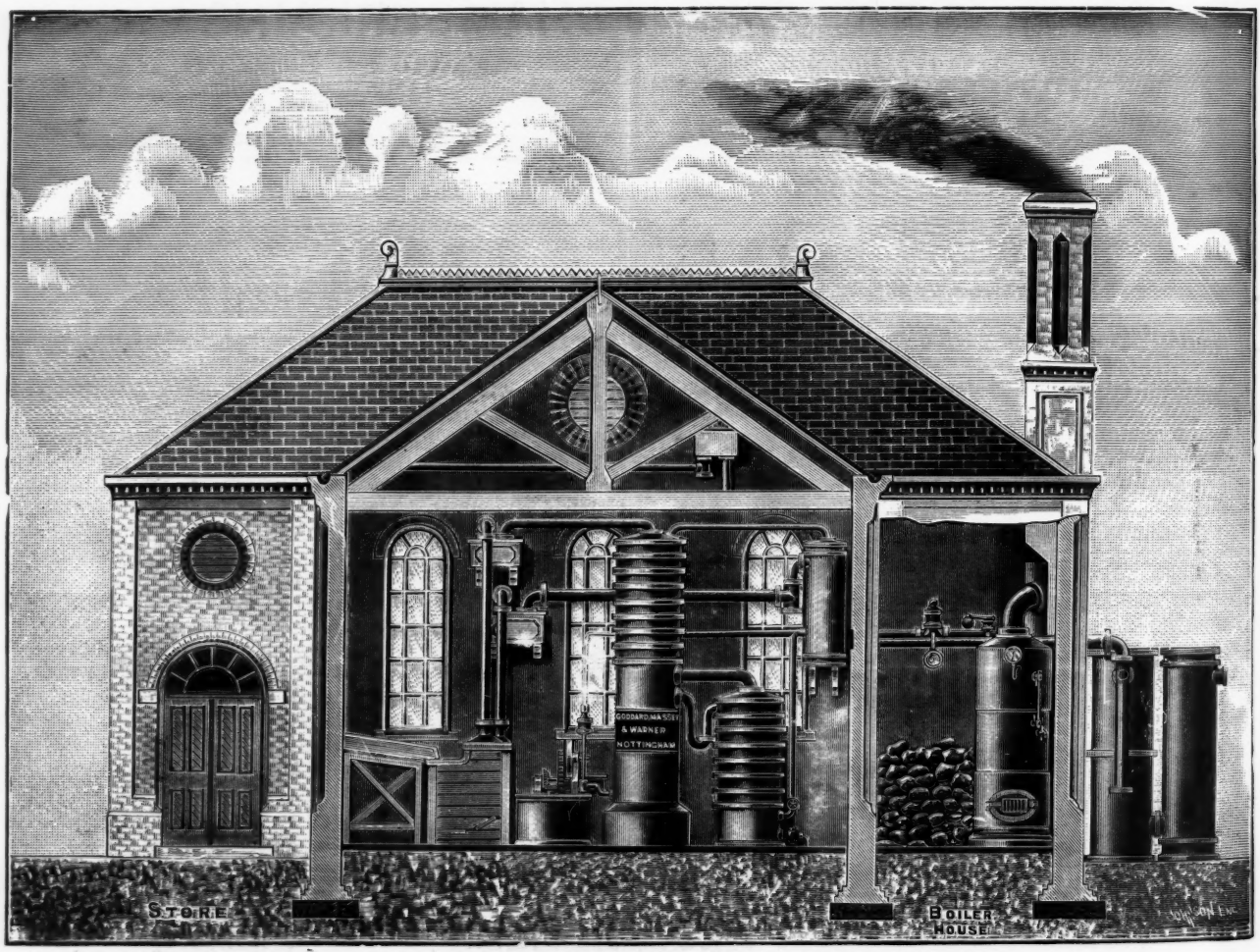

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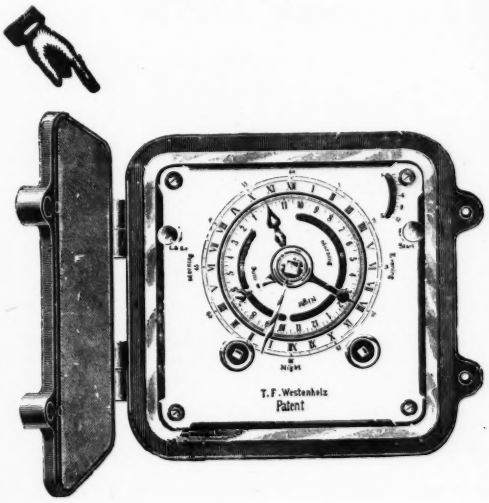

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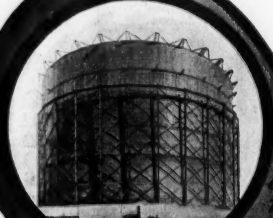

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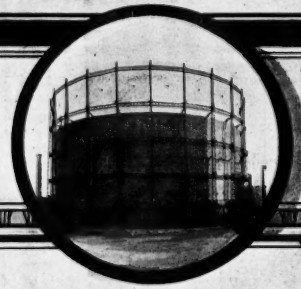

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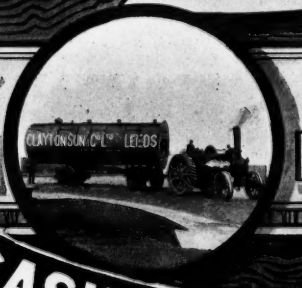

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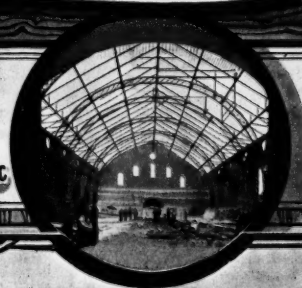

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GASHOLDER WITH LARGEST METAL TANK IN THE WORLD, 242 Ft. DIA. 41 Ft. DEEP.

LONDON OFFICE,
60, QUEEN VICTORIA St. E.C
TELEGRAMS. "GAS, LEEDS".

MAKERS OF HIGH-CLASS BOILERS FOR GAS AND ELECTRIC LIGHT WORKS, FITTED WITH **DEIGHTON'S CORRUGATED FLUES:** THESE FLUES GIVE GREATLY INCREASED HEATING SURFACE, AND ARE SPECIALLY RECOMMENDED FOR **HIGH-PRESSURE BOILERS.**

STRUCTURAL STEEL WORK OF EVERY DESCRIPTION.

ALL COPPER.

OUTDOOR.

THE PINNACLE OF FAME

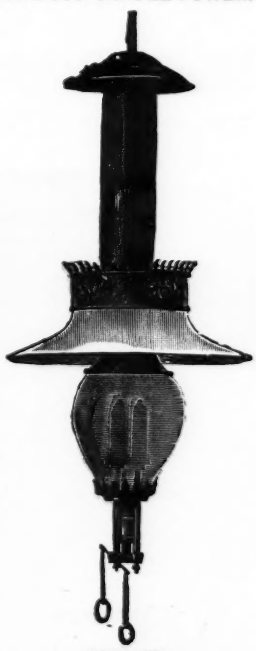
Has indeed been reached by the well-known

"WIS" LAMP

J. G. Tooms, Esq., the well-known Manager of the Waterford Gas Co.,

"Considers that he obtained more satisfaction from the 'Wis' Lamp than from a High Pressure Installation fitted in one of his shops—and he certainly would not recommend any compressed gas, but a form of Self-Intensifying Lighting such as the 'Wis' Light."

400 & 700-CANDLE POWER.



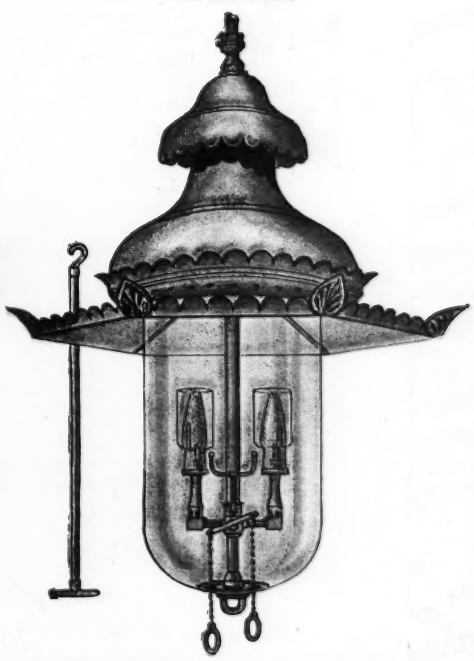
INDOOR.

COMMENT IS SUPERFLUOUS.

POND & CO.

are gratified to be able to announce that owing to the ever increasing demand for the far-famed "Wis" Lamp, they are again compelled to increase their Works, Offices, etc., and have acquired additional premises at 59a, Farringdon Street, and 24, Farringdon Avenue, where all orders can now be met promptly by an increased staff.

ALL COPPER.



EXTENSION OF PREMISES

62-59, FARRINGDON STREET,

AND

24, FARRINGDON AVENUE,

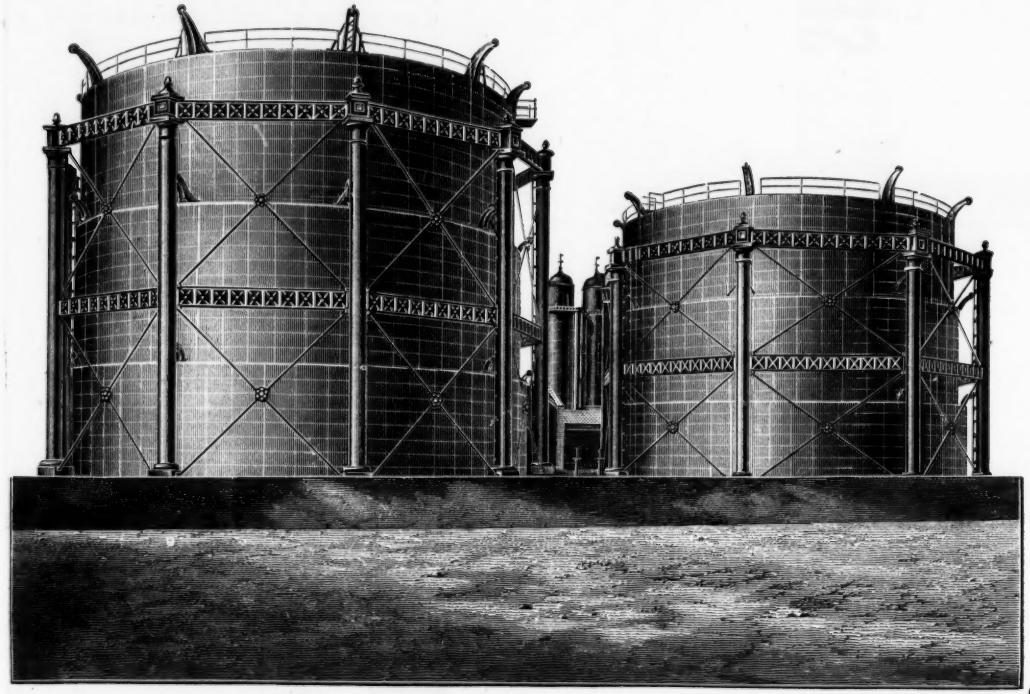
LONDON, E.C.

PATENTEES, LANTERN MANUFACTURERS, BRASS FOUNDERS AND CONTRACTORS.

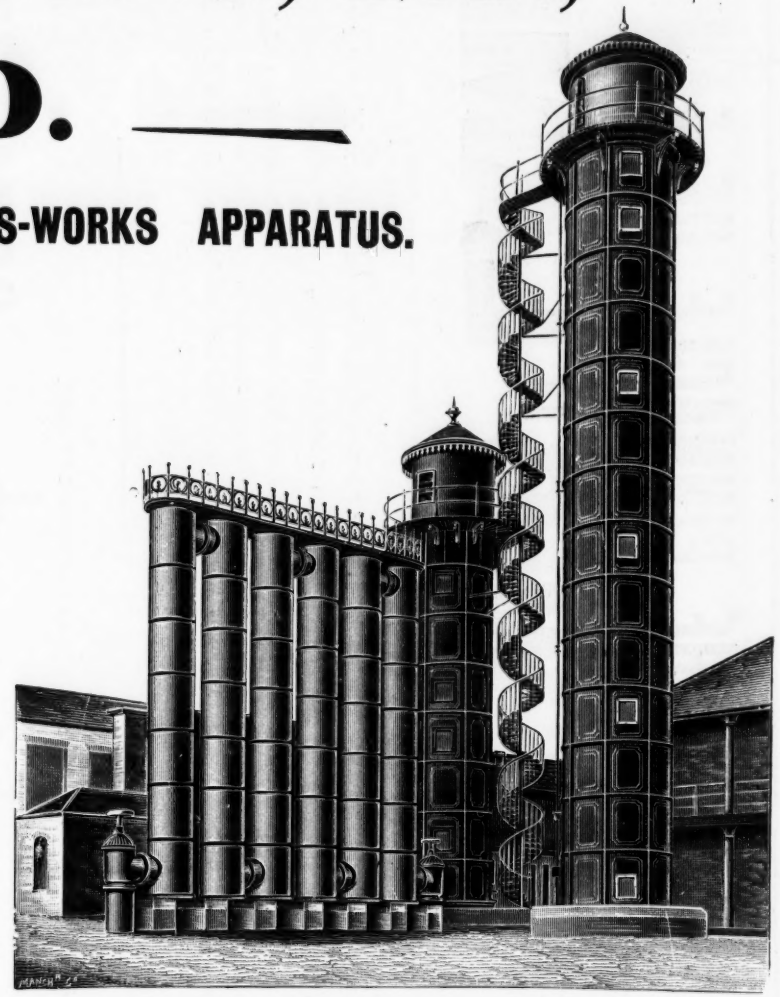
R. DEMPSTER & SONS, Ltd.,

ELLAND.

MANUFACTURERS OF EVERY DESCRIPTION OF GAS-WORKS APPARATUS.

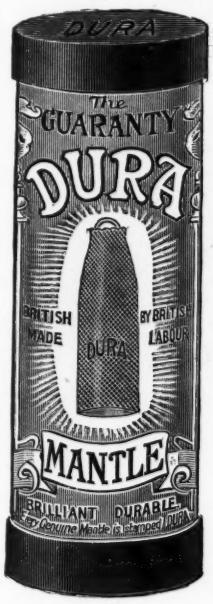


Gasholders.
With Inner Lifts rising above Guide Framing.



Annular Condensers.
Tower Scrubbers.

SEASON 1904-1905.



"DURA"

INCANDESCENT

MANTLES

Made from Best ENGLISH RAMIE,

FOR ALL BURNERS IN USE.

UNEXCELLED FOR

STREET LIGHTING & MAINTENANCE.

Used largely by

GAS COMPANIES in the UNITED KINGDOM AND ABROAD.

SEND US YOUR ENQUIRIES.

SAMPLES AND LOWEST PRICES ON APPLICATION.

SOLE MANUFACTURERS—

THE GUARANTY INCANDESCENT MANTLE CO., LTD.,

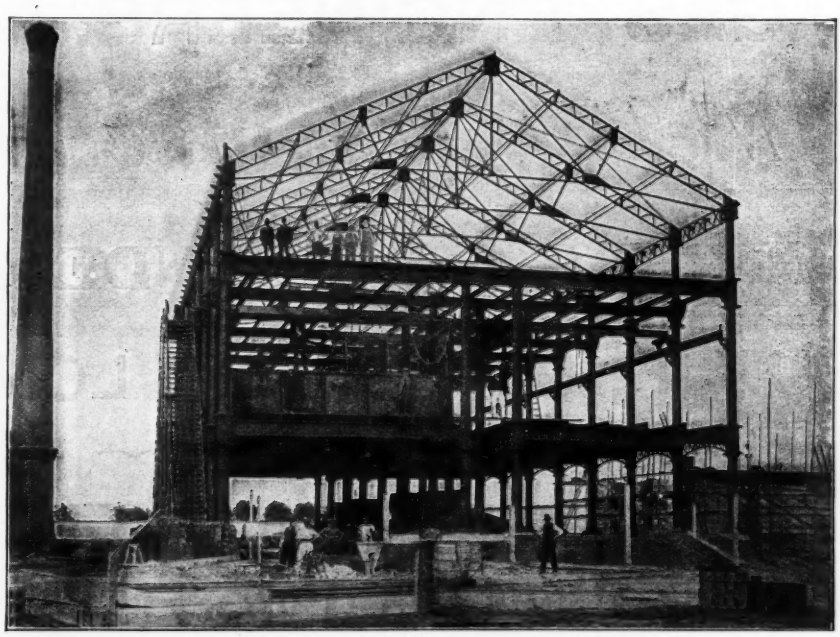
Phœnix Works, STREATHAM, LONDON, S.W.

National Telephone: 27 STREATHAM. Telegraphic Address: "UNLIMITED, LONDON."

THE WHESSOE FOUNDRY CO., LTD.

Works: DARLINGTON.

MAKERS OF EVERY DESCRIPTION OF GAS PLANT.



GASHOLDERS AND DRY-SEAL PURIFIERS A SPECIALITY.

PHOTO. OF STAGE-FLOOR PURIFIER-HOUSE TAKEN DURING ERECTION FOR THE UNION DES GAZ AT THEIR WORKS NANTERRE, PARIS.

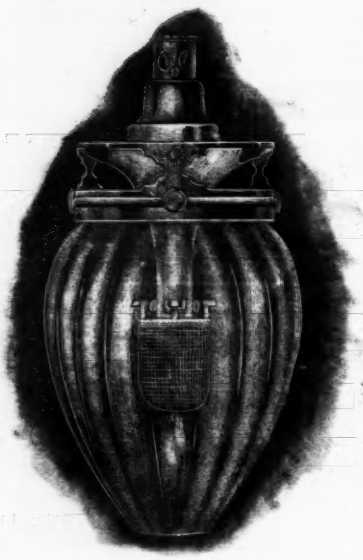
London Office: 106, CANNON STREET, E.C.

THE ORIGINAL NEW INVERTED INCANDESCENT GAS-BURNERS

BRITISH MANUFACTURE.

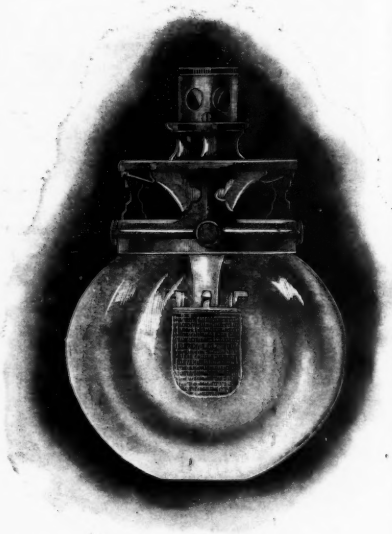
INCREASED DISCOUNTS TO THE TRADE.

New types of BURNERS at popular Prices.



MAXIMUM LIGHT WITH MINIMUM CONSUMPTION OF GAS.

The "Bijou" Burner in clusters for interior lighting has the decorative effect of Electric light at One-Eighth the cost.



NEW LISTS NOW READY.

No. 2 Burner only, in Polished Brass or Steel Bronze, 4s. 6d.
Globes from 6d. each. Mantles 7s. per dozen.

No. 3 "Bijou" Burner only, in Polished Brass or Steel Bronze, 3s.
Globes from 4d. each. Mantles 6s. 6d. per dozen.

ONLY ADDRESS: **THE NEW INVERTED INCANDESCENT GAS LAMP CO., LD.,**
23, FARRINGDON AVENUE, E.C.

We shall be Exhibiting at the International Gas Exhibition, Earl's Court, W., Nov. 19 to Dec. 17, at STAND No. 60. A visit will be esteemed.

R. LAIDLAW & SON, LIMITED.

GAS ENGINEERS,

Gas Meter Manufacturers,

AND

IRON & BRASS FOUNDERS,

EDINBURGH, GLASGOW, & LONDON.

SEE OUR EXHIBIT,

INTERNATIONAL GAS EXHIBITION, EARL'S COURT,

STAND No. 135, Queen's Palace.

CLAPHAM BROTHERS LIMITED

WELLINGTON NELSON & MARKET ST WORKS

KEIGHLEY.

ESTABLISHED 1837.

VALVES
LAMP COLUMNS
STRUCTURAL
IRON WORK.
RETORT-BENCH
MOUNTINGS

CLAPHAM'S PATENT "ECLIPSE" SPECIALITIES.

TANKS.
MAINS.
GIRDERS.
GUTTERS.
CLAPHAM'S PATENT WASHER-SCRUBBER.
CONDENSER.
TUBE
WATER
PATENT
CLAPHAM'S

"NEW CENTURY" COVER WITH CLAPHAM'S PATENT JOINT & AUTOMATIC FASTENER FOR DRY-LUTE PURIFIERS.

RETORT MOUTHPIECES, SELF SEALING, HORIZONTAL OR INCLINED.

CONTRACTORS TO HIS MAJESTY'S GOVERNMENT.

LONDON AGENT: T.B. YOUNGER, C.E. 98, GREAT TOWER STREET.

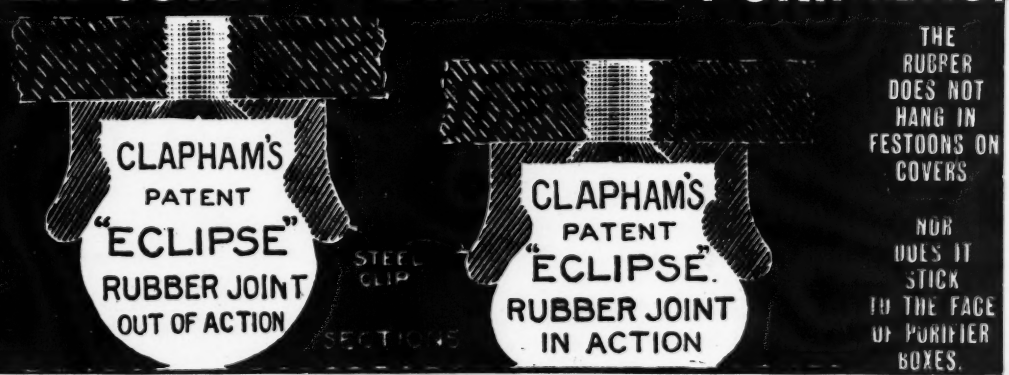
RUBBER JOINT FOR DRY LUTE PURIFIERS.

ALL TROUBLES REMOVED.

PERFECT JOINT SECURED.

ENTIRE SATISFACTION GIVEN.

8578 FT. ORDERED.


CLAPHAM'S PATENT "ECLIPSE" RUBBER JOINT OUT OF ACTION
STEEL CLIP
SECTIONS
CLAPHAM'S PATENT "ECLIPSE" RUBBER JOINT IN ACTION

THE RUBBER DOES NOT HANG IN FESTOONS ON COVERS

NOR DOES IT STICK TO THE FACE OF PURIFIER BOXES.

SPECIALLY MADE TO RESIST THE ACTION OF GAS.

Supplied to the following Places:

Altrincham, Driffield, Elgin, Hong Kong, Hunstanton, Lancaster, Leeds, Leigh, Manchester, Matlock, New Mills, South Metropolitan (London), South Shields, Smyrna, Tyldesley, Wallasey, and others.

BIGGS, WALL, & CO.,

GAS ENGINEERS & CHEMICAL PLUMBERS.

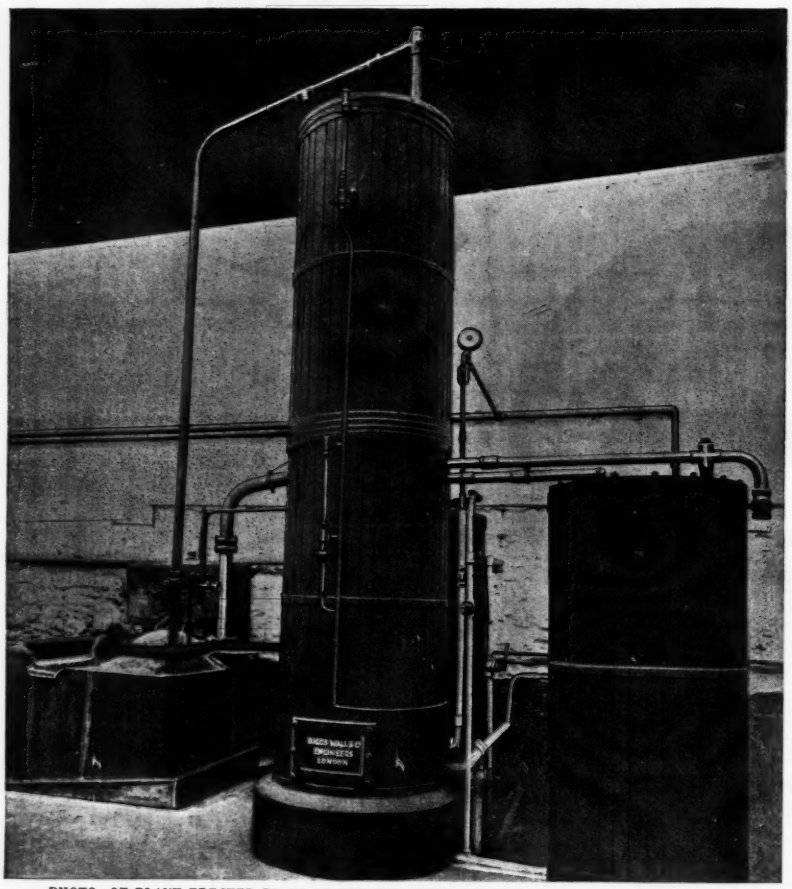


PHOTO. OF PLANT ERECTED BY US AT THE INCHICORE GAS-WORKS.—C. B. Outon, Engineer.

SPECIALITY:

Sulphate of Ammonia Plants with our Improved Still, Trays removable and easily cleaned, highest economy in working, splendid quality of salt (actual results in practice, 25·50 per cent. of ammonia), self-discharging Saturators and every modern improvement.

Lead Burners sent anywhere, on receipt of telegram, for urgent repairs.

"RAPID" MANUAL & POWER CHARGING APPARATUS,

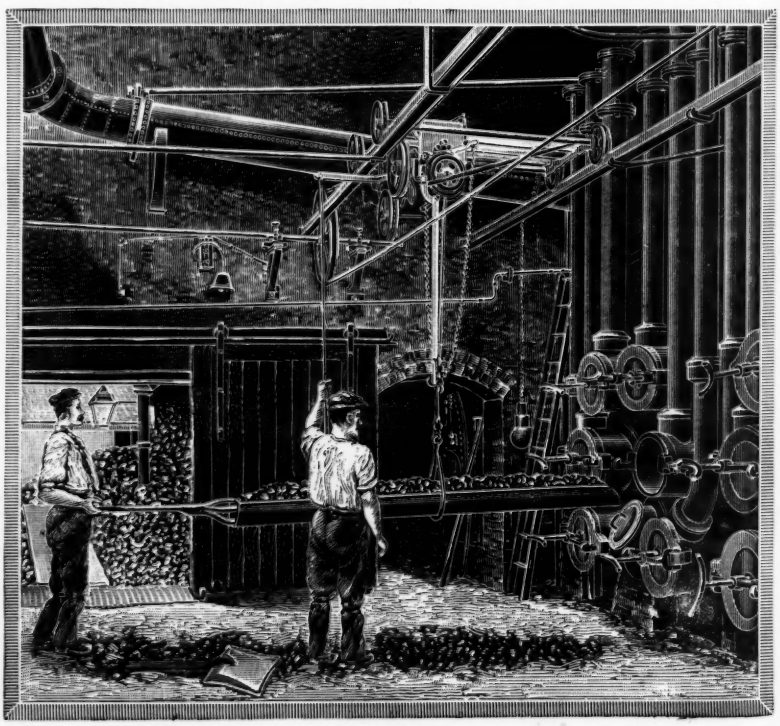
FOR GAS-WORKS OF ALL SIZES.

Repeat Orders

YEOVIL, NEWPORT, SOUTHBANK, WORTHING, ALDERSHOT.

Machines can be seen working at any of the following Works:—

ALDERSHOT	WREXHAM
WORTHING	SWINDON
YEOVIL	EPSOM
TRURO	SHETTLESTON
NORMANTON	DUBLIN
WESTON-SUPER-MARE.	G. S. & W. Rly. Works
GOOLE	NEWPORT, MON.
HARLOW	CLEVEDON



13, Cross Street, Finsbury, LONDON, E.C.

Telegrams: "RAGOUT, LONDON." Telephone: 273 CENTRAL.

HOLMSIDE GAS COALS.

LABORATORY ANALYSIS: By Messrs. J. & H. S. Pattinson.

Yield of Gas per ton	10,500 Cubic Feet.	Illuminating Value expressed in Sperm	612 lbs. per ton.
Illuminating Power	17 Standard Sperm Candles.	Coke	68·8 per cent.
Volatile Matters	31·2 per cent.		

HOLMSIDE GAS COALS are supplied to the principal Gas Companies at Home and Abroad, the daily produce being about 5,500 tons. These Coals are well-known to be amongst the best produced in the County of Durham, and are shipped on the River Tyne in Tyne Dock, and at Dunston Staiths; also at North and South Docks, Sunderland.

SOUTH MOOR PELTON GAS COALS

Are of equal quality to the "Holmside" Coal and are also largely used by Gas Companies at Home and Abroad. They are shipped in Tyne Dock, and Dunston Staiths; and at North and South Docks, Sunderland.

Both descriptions can be bought through the principal Merchants in England, or from

MR. MARK ARCHER, HOLMSIDE AND SOUTH MOOR OFFICES, NEWCASTLE-UPON-TYNE,

From whom copies of Analysis and further Particulars may be obtained.

THE

"BRAY"

XXX GAS-MANTLE.

DOUBLE WOVEN RAMIE FIBRE. EXTRA STRONG.

A BRILLIANT WHITE LIGHT.

BURNS BRIGHTER AND LASTS LONGER THAN ANY OTHER MANTLE.

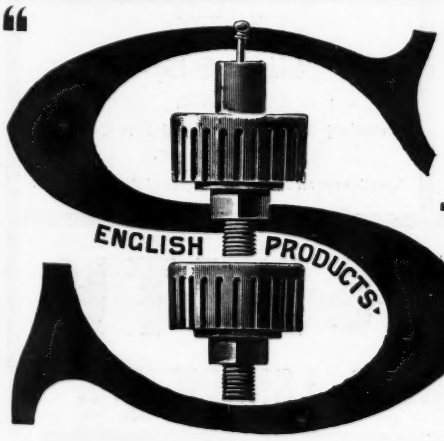
ASK FOR SAMPLES AND PRICES

At International Gas Exhibition, Earl's Court, Nov. 19 to Dec. 17.

Stands Nos. 120 and 141.

GEO. BRAY & CO., LTD., GAS LIGHTING ENGINEERS, LEEDS.

"



A BOON TO MASTER, MAN, and MACHINE.

TAUFFER'S

REG. TRADE MARK.

CENTIGRADE FOR HOT PLACES **LUBRICANT"**

TANDARD MACHINE GREASE.

AVING UP TO 90 PER CENT. OVER LIQUID OIL.

Patent "Unbreakable" & "Telltale" Stauffer Lubricators.

SOLE MAKERS—

TRIER BROS., 1, GT. GEORGE ST., WESTMINSTER, LONDON.

CUMBERLAND WORKS, NEW CHURCH RD., CAMBERWELL

BRILLIANT UNDER ALL PRESSURES.

"GLASMI" FIRST-GRADE MANTLES.

Registered. Made for any Burner on the Market. *Unequalled.*

THE

"BRIGHTRAY"

INVERTED CLUSTER LAMP.

FOR INDOOR AND OUTDOOR LIGHTING.

The only Practical Inverted Cluster Lamp on the Market.

No. 7728.
For Indoor Use,
66/-
SUBJECT,
Complete, with Mantles, as Shown,
Lengths over all 19 ins.
Reflector 20 ins.

HAS THE SMART APPEARANCE OF ELECTRIC LIGHT AT A FRACTION OF THE COST.

QUITE SHADOWLESS.

NOTHING TO GET OUT OF ORDER.

SEE OUR STAND AT GAS EXHIBITION.

NEW PATTERN INCANDESCENT ARC LAMP

THE

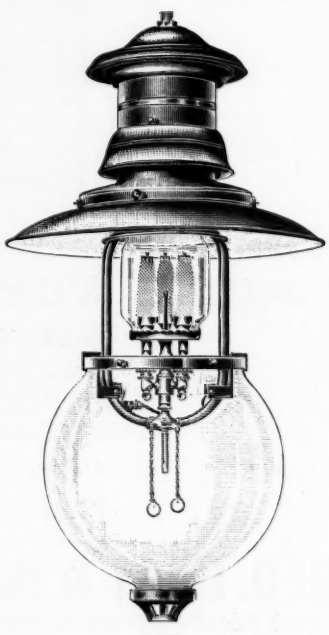
'Kensington'

HIGH EFFICIENCY.

LOW CONSUMPTION.

Always in Order.

Easy to Light and Clean.



No. 7766.
4-Light 85/-
SUBJECT,
Showing Globe Lowered for Cleaning Purposes, &c.
Length over all 27 ins. Diameter of Reflector 20 ins.

WRITE FOR New List AND PRICES.

J. AND W. B. SMITH,

19 TO 23, FARRINGDON ROAD, LONDON, E.C.

W. J. JENKINS & CO. LIMITED,

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MAKERS OF

RETORT STOKING MACHINERY.

21 INSTALLATIONS AT WORK AND ON ORDER.

DERBY GAS WORKS.
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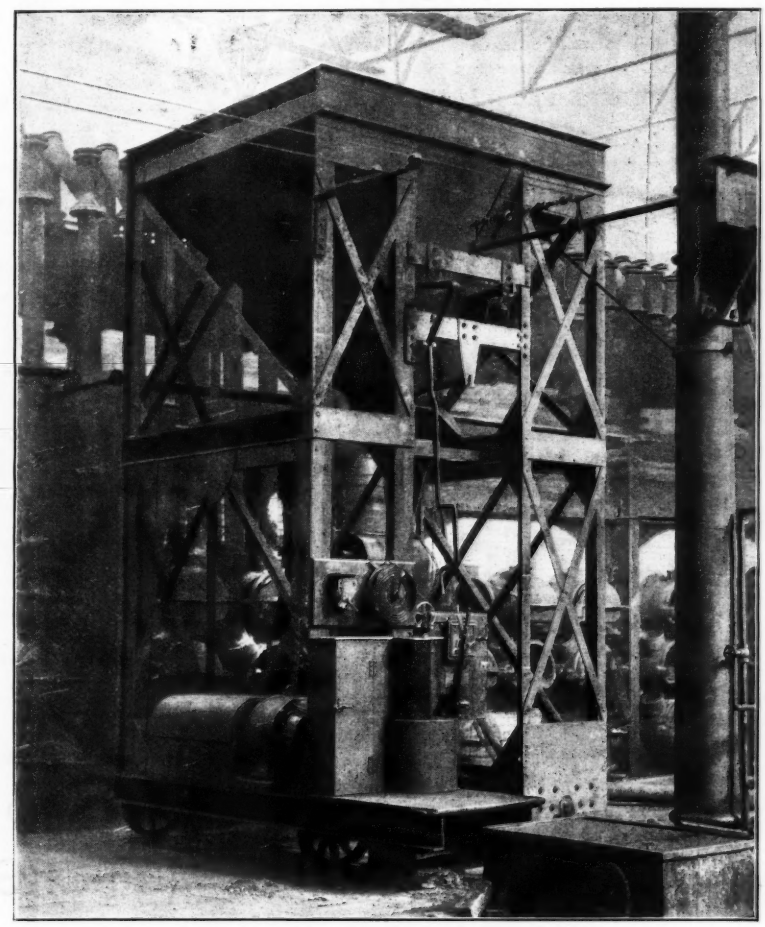
NUNEATON GAS WORKS.
OTLEY GAS WORKS.
FARNWORTH GAS WORKS.
GASLIGHT & COKE CO. (NINE ELMS).



BURY.
SALFORD.
BLACKBURN.
DOUGLAS (I. OF M.).
STOCKTON-ON-TEES.
COMMERCIAL GAS CO. (STEPNEY).
NOTTINGHAM, EAST-CROFT.
NOTTINGHAM, BASFORD.
SUNDERLAND.
ALLOA (SCOTLAND).
LANCASTER.
CAMBRIDGE.
DARWEN.

Photograph of the D.B. Patent Coal Projector as installed at the Blackburn Gas Works.

ALSO SOLE MAKERS OF THE ORIGINAL

DE BROUWER PATENT HOT COKE CONVEYOR

Which has always led the way and still serves for all Competitors to follow and copy.

OVER 32 INSTALLATIONS AGGREGATING 3½ MILES OF CONVEYOR AT WORK, IN EVERY INSTANCE SATISFACTORILY.

ROOFS.	HYDRAULIC MAINS.	ELEVATORS.	PURIFIERS.
STAGE FLOORS.	RETORT FITTINGS.	CONVEYORS.	CAST IRON TANKS.

INCLINED AND HORIZONTAL RETORT SETTINGS.

ECONOMICAL AIR COMPRESSORS, GAS AND AIR FANS, AIR LIFT PUMPS.

SEE OUR STAND AT EARL'S COURT EXHIBITION.

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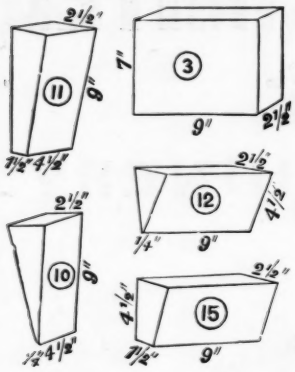
BEE-HIVE WORKS, RETFORD (NOTTS.)

STEPHENS & CO., KIDWELLY.

Contractors to a large number of the Principal Gas-Works.



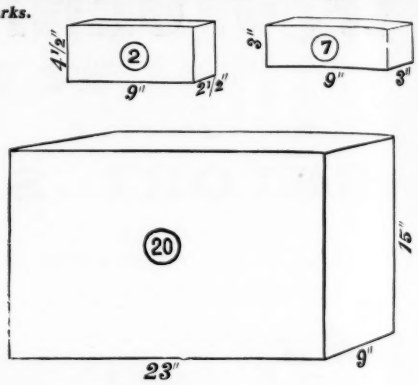
SPECIAL IMPROVED

SILICA BRICKS, BLOCKS, SHIELDS, TILES.

SPECIAL PLASTIC SILICA CEMENT.

Without doubt the finest Materials in the Market for Gas-Works Furnaces.

BRICKS, BLOCKS, TILES, & SHIELDS of any shape made to order.



Do not Neglect to see

"THE" PREPAYMENT SLOT METER,

"CONVERTIBLE" STOP ACTION METER,

AND THE NEW

"SIMPLEX" PREPAYMENT SLOT METER,

YOU WILL BE INTERESTED.

STAND 50D.

Between Ducal Hall and Queen's Palace, Annexe. . .

INTERNATIONAL GAS EXHIBITION

EARL'S COURT,

Nov. 19 to Dec. 17, 1904.

METROPOLITAN GAS METERS, LIMITED.

MAKERS OF ORDINARY PREPAYMENT AND STOP ACTION DRY GAS METERS.

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Tel. Address: "GASOMETER, NOTTINGHAM."
Telephone No.: 204X NOTTINGHAM.
Midland Counties Office: STANDARD BUILDINGS, CITY SQUARE, LEEDS.

London Depot: 6, MALT STREET, OLD KENT ROAD, S.E.
Tel. Address: "GASOMETER, LONDON."
Telephone: 2044 HOP.
MR. BURN, 11, NEWTON ROAD, BAYSWATER, W.
Telephone: 2783 PADDINGTON.

BUHLMANN MANTLES.

PIONEERS of CHEAP PRICES for BRITISH MANUFACTURE, STRONGEST and BEST for STREET LIGHTING.

SPECIAL PRICES FOR

10 Gross Lots (delivered free).
100 ,, ,, ,, ,, and other Concessions).

— PARTICULARS OF —

THE BUHLMANN INCANDESCENT SYNDICATE, LTD.,

WESTON ST., BROMLEY-BY-BOW, LONDON, E.

THE BARROWFIELD IRON-WORKS, LIMITED,

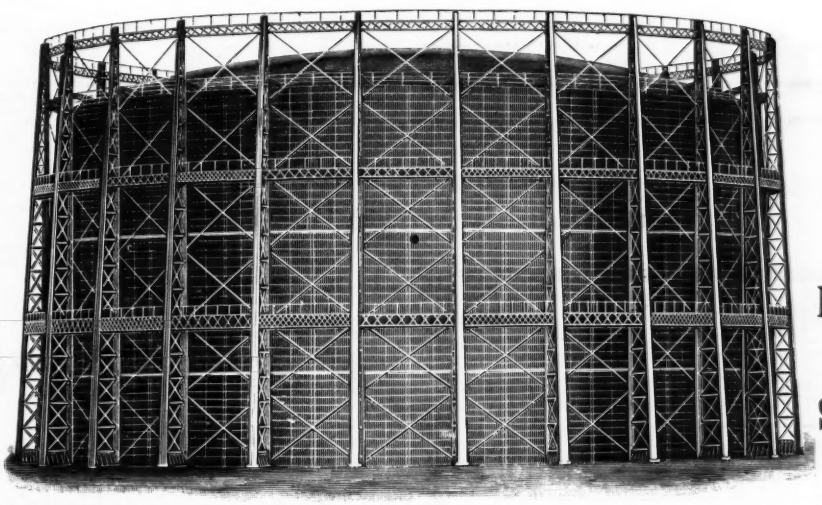
GAS ENGINEERS & CONTRACTORS,

GLASGOW.

Telegrams: "GASOMETER GLASGOW."

OIL PLANT AND CHEMICAL APPARATUS.

BRIDGES, GIRDERS, WHARVES, PIERS.



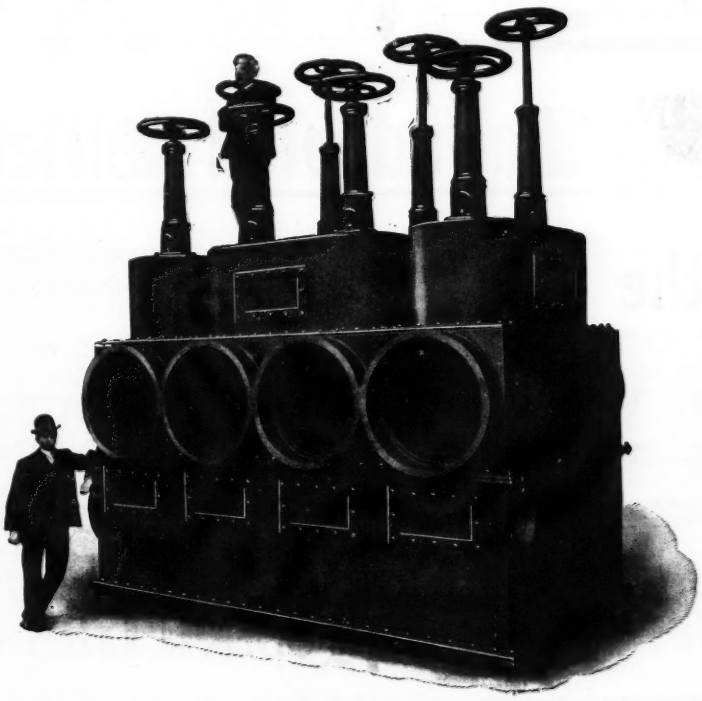
GAS APPARATUS OF EVERY DESCRIPTION.

RETORTS, CONDENSERS, SCRUBBERS, PURIFIERS.

TWO THREE-LIFT GASHOLDERS, Capacity EIGHT-AND-A-HALF MILLION cubic feet each.
280 feet Diameter by 50 feet Deep each Lift. Erected at Glasgow.

ROOFING OF EVERY STYLE.

PIPES, VALVES, AND CONNECTIONS.



GASHOLDERS AND TANKS.

ENGINES, EXHAUSTERS, STEAM BOILERS, AND FITTINGS.

Weck's Centre-Valve for 30-inch Connections for GRANTON GAS-WORKS of the EDINBURGH and LEITH CORPORATIONS GAS COMMISSIONERS.

London Office: 6, LITTLE BUSH LANE, CANNON STREET.

THIS TALKS!!!

We have Lighted a Section of Plymouth Docks
for the Great Western Railway Company.

An Extension has been Ordered.

We have completed at Aylesbury an Installation—Town Hall, Market, &c.

The Council has unanimously decided that we be requested to do the whole of the Public Lighting.

We are

50	per cent. Cheaper than	Incandescent Gas.
70	,,	Electric Arc.
80	,,	,, Incandescent.
120	,,	Ordinary Fishtail.

BERLIN, the Finest Lighted City in the World, **has adopted Millennium**

It is the **LAST WORD.**

THE MILLENNIUM SYSTEM IS A METHOD OF COMPRESSING ORDINARY GAS. . . . .

If you want to get MORE LIGHT and CUT THE COST, write—

The British Compressed Gas Co., Ld.,

57, BARBICAN, E.C.

TIMMIS'S PATENT

CLINKERING DOOR.

For Illustrated Advertisement, with full Particulars see "JOURNAL" for Nov. 15, p. 497.

GEO. H. TIMMIS,

River Stour Works, STOURBRIDGE.

Telegrams: "TIMMIS, LYE." National Telephone: 13, LYE.

or of HARPER & MOORES, LTD.,

STOURBRIDGE.

THE LEEDS FIRECLAY CO., LTD.

CLIFF'S BRANCH.

LONDON OFFICES & DEPÔTS:

Baltic Wharf, Waterloo Bridge, S.E.
and G.N. Goods Station,
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Liverpool: Leeds Street.
Leeds:
Queen Street.

CLIFF'S PATENT
Machine-Made Retorts

Cliff's Patent Machine-Made Retorts possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made.

Retorts carefully Packed for Export.

Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.

SCOTT SNELL

GAS LAMPS OUTSHINE ALL OTHER LAMPS

WHY THE SCOTT SNELL LAMP IS

The Most Efficient AND The Most Economical } GAS LAMP IN THE MARKET.

BECAUSE a light of **600** CANDLES can be obtained from a SINGLE BURNER with 15 CUBIC FEET OF GAS per hour.

ABSOLUTELY THE HIGHEST EFFICIENCY IN GAS LIGHTING.

The BEST LAMP for:

PUBLIC STREET LIGHTING.
RAILWAY STATIONS. PLATFORMS.
DOCKS. WAREHOUSES. LARGE INTERIORS.
LANDING STAGES. PIERS. JETTIES.
SEA FRONTS.
GAS-WORKS. RETORT-HOUSES, &c., &c.

No High-Pressure Mains.
No Disturbance of Service.

Special terms to Gas Companies and Municipal and District Councils.

Illustrated Catalogue and Full Particulars on application to

THE SCOTT SNELL SELF-INTENSIFYING GAS LAMP CO., LTD.,

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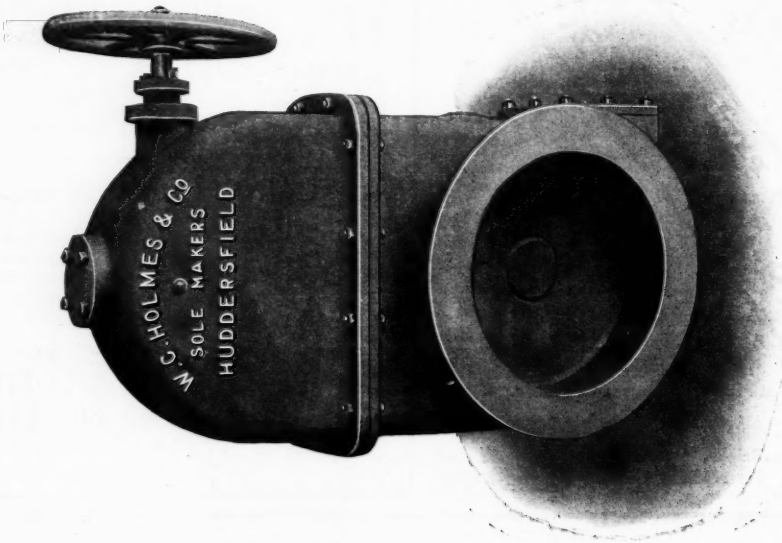

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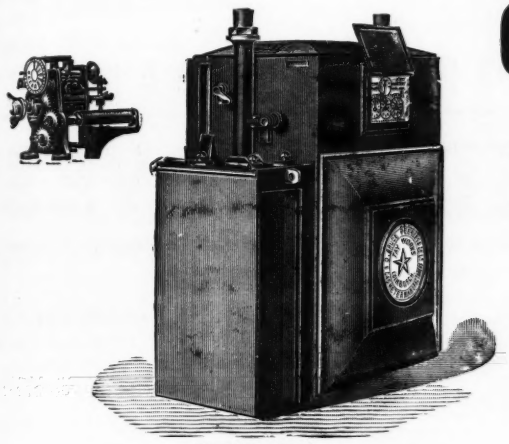

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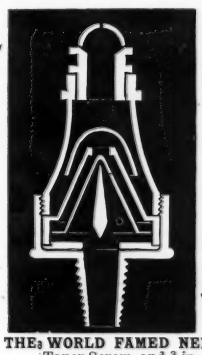

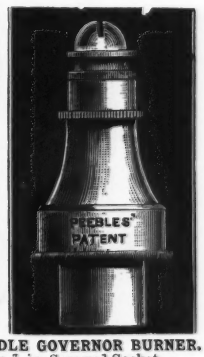

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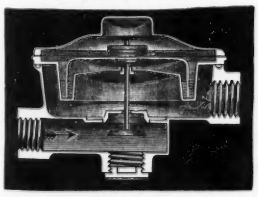

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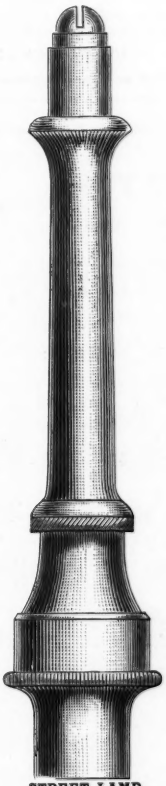

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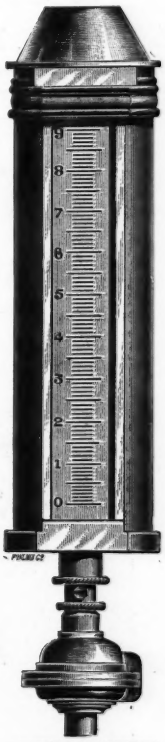

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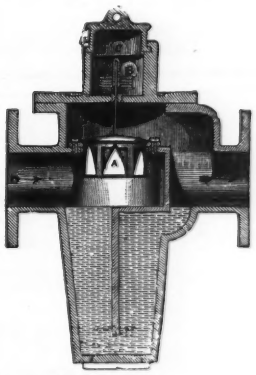

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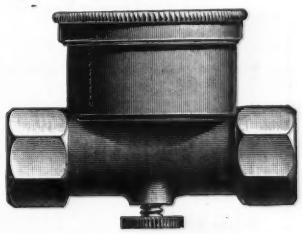

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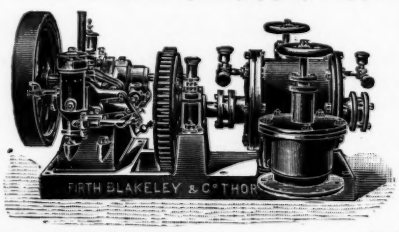

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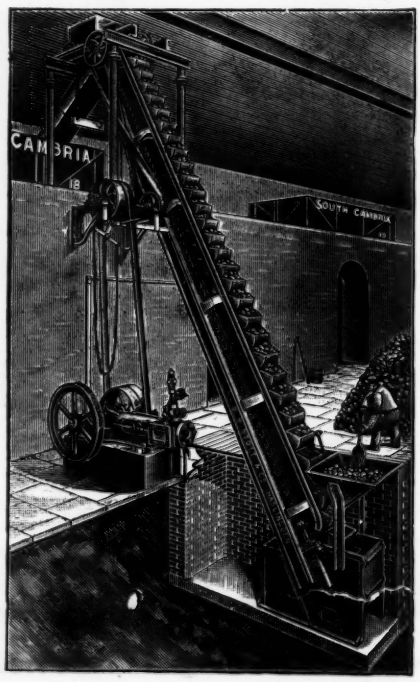

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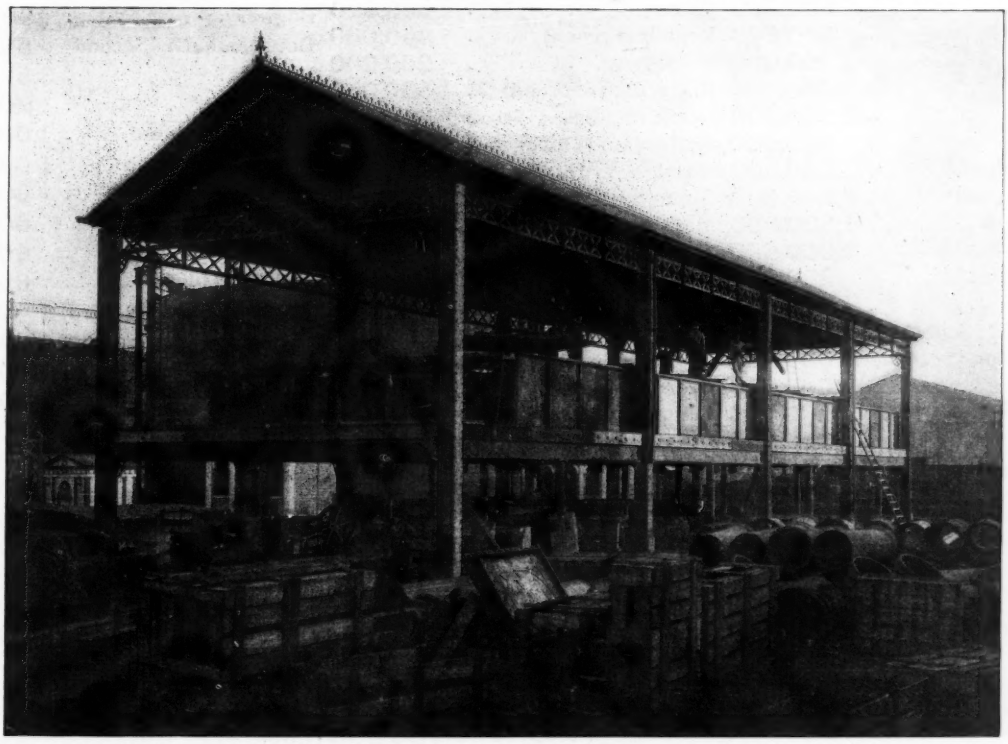

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Copenhagen (Second)	2,500,000	St. Joseph, Mo.	750,000	Epsom	225,000
Belfast	1,700,000	Lea Bridge	350,000	North Middlesex	150,000
Belfast (Second)	4,500,000	Lea Bridge (Second)	350,000	Wandsworth & Putney	1,800,000
Brussels—Ville	750,000	Stockton-on-Tees	500,000	Aarhus	800,000
Brussels—Ville (Second)	750,000	Edinburgh	2,000,000	Falmouth	150,000
Liverpool	3,500,000	Guildford	350,000	Southampton	800,000
Liverpool (Second)	4,500,000	Brentford	1,200,000	Hartlepool	750,000
Tottenham	750,000	Syracuse, N.Y.	850,000	Utrecht	1,000,000
Tottenham (Second)	750,000	Bridlington	150,000	Deventer	150,000
Santiago de Cuba	400,000	Middlesbrough	1,250,000	Portsmouth	1,000,000
Swansea	750,000	Croydon	1,250,000	Bournemouth	1,000,000
Manchester	3,500,000	L. & N.W. Rly., Crewe	700,000	Aylesbury	150,000
Brighton	1,750,000	Taunton	225,000	Hamburg	1,750,000
Preston	1,400,000	Lawrence, Mass.	400,000	Redhill	275,000
New York	1,200,000	Commercial Gas Co.	850,000	Dublin	2,000,000
Southport	750,000	Commercial (Second)	850,000	Posen	450,000
Bath	1,000,000	Commercial (Third)	1,250,000	Dunedin, N.Z.	150,000
Newburgh, N.Y.	350,000	Rotterdam	850,000	Lincoln	500,000
Newburgh (Second)	250,000	Dorking	150,000	Brighton (Second)	1,850,000
Hoylake	125,000	McKeesport, Pa.	500,000	Stockport (Second)	600,000
Coventry	600,000	G. L. & C. Co., Bromley	3,750,000	Croydon (Second)	625,000
Coventry (Second)	600,000	G. L. & C. Co., Nine Elms	2,750,000	Maidenhead (Second)	225,000
Bordentown, N.J.	125,000	Durham	200,000	G. L. & C. Co., Beckton	2,250,000
Winchester	225,000	New York	4,000,000	G. L. & C. Co., Fulham	1,750,000
Shanghai	225,000	Scarborough	800,000	Watford	300,000
Stockport	600,000	Perth, W.A.	125,000	Eastbourne	1,250,000
Norwich	1,000,000	Bremen	550,000		

Since Jan. 1st 1900.

				FOR THIS YEAR'S CONSTRUCTION.	
Antwerp	1,500,000	The Hague	1,000,000	Dunedin (Second)	275,000
Brussels—Forest	1,000,000	Romford	300,000	Taunton (Second)	350,000
Tottenham (Third)	350,000	Göteborg	300,000	Bognor	100,000
Sydney (Harbour)	500,000	Carlisle	600,000	Bournemouth (Second)	500,000
Sydney (Mortlake)	500,000	Redhill (Second)	300,000	Vienna	3,500,000
Manchester (Second)	3,500,000	Heidelberg	200,000	Maastricht	200,000
Longton	600,000	Rotterdam (Second)	1,500,000	Antwerp (Second)	1,000,000
Hull	1,500,000	North Middlesex (Second)	200,000	Tottenham (Fifth)	1,000,000
St. Gallen	225,000	Rotterdam (Third)	750,000	The Hague (Second)	500,000
Colney Hatch	400,000	Merthyr Tydfil	300,000	Hampton Court	500,000
Dublin (Second)	2,000,000	Shanghai (Second)	225,000	Lea Bridge (Third)	400,000
Birmingham	1,500,000	Magdeburg	1,400,000	Dublin (Third)	65,0000
Tunbridge Wells	1,000,000	Posen (Second)	700,000	North Middlesex (Third)	75,000
Faversham	200,000	Barrow	300,000	St. Gallen (Second)	225,000
Staines	600,000	Reichenberg	200,000	St. Josse, Brussels	1,000,000
Commercial (Fourth)	2,000,000	West Ham	1,500,000	Dundee	1,500,000
Southampton (Second)	500,000	Deventer (Second)	200 000	Bridgwater	200,000
Liége	1,000,000	Bremen (Second)	950,000	West Ham (Second)	800,000
Hebden Bridge	200,000	Malta	400,000	Brieg, Silesia	100,000
Chorley	300,000	Croydon (Third)	625,000	Brussels–Ville (Fourth)	350,000
Stafford	500,000	Tilburg	400,000	Innsbruck, Austria	200,000
Bridlington (econd)	200,000	Ostend	100,000	Marlborough	100,000
Beckton (Second)	10,750,000	Zwolle	200,000	Flensburg	300,000
Tottenham (Fourth)	1,000,000	Utrecht (Second)	1,000,000	Weston-super-Mare	300,000
Gosport	200,000	Port Elizabeth	400,000	Wexford	100,000
Brussels—Ville (Third)	1,500,000	Sydney–Harbour (Second)	500,000	Budapest	50,000
Swansea(Second)	1,000,000	Sydney–Mortlake(Second)	500,000		
Waltham	400,000	Watford (Second)	350,000		
Geneva	500,000	Southport (Second)	900,000		

H. & G. TOTAL OF ABOVE CAPACITIES **151,300,000** CUBIC FEET DAILY.
UNITED GAS IMPROVEMENT CO., U.S.A. **429,700,000** CUBIC FEET DAILY.

TOTAL 581,000,000 CUBIC FEET DAILY.

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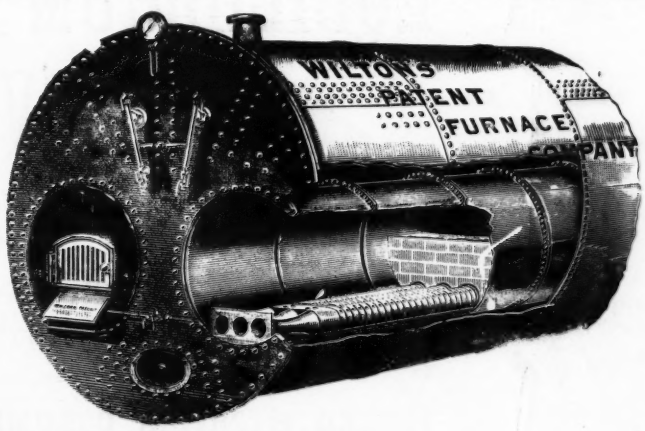

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JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

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EDITORIAL NOTES—GAS, &c.

The Opening of the Gas Exhibition.

THE great Gas Exhibition of 1904 was formally opened on Saturday with all the circumstance befitting so important an occasion. To meet the Lord Mayor and Sheriffs of London had been invited the Mayors of the Metropolitan and Suburban Boroughs and the Lord Mayors and Mayors of the most important Provincial cities and towns, representatives of the principal gas undertakings throughout the Kingdom, and also of the exhibitors. A goodly number responded to the invitation. It was a happy blending of the three several interests; and the management were particularly well advised in enlisting the sympathy of municipal authorities, seeing that the success of gas enterprise depends largely upon the attitude of the latter, while, as was very aptly put by Mr. J. Milne Watson, when proposing at the banquet the toast of "The Visitors," gas is a real aid to municipal government in the performance of one of its first duties, by placing within its reach the means of cheap and effective public lighting.

The Lord Mayor and the other distinguished visitors were conducted round the exhibition by Mr. H. E. Jones, the President of the Exhibition, Mr. James W. Helps, the Chairman of the Advisory Committee, and other members of the latter. They could not but be very greatly impressed with what they saw. Incomplete though it still is in some few respects, a marvellous transformation had been effected during the previous forty-eight hours; and there was more than enough to indicate that a huge success had been achieved. On every hand were indications of the almost numberless uses to which gas is now applied—not merely in a typical form, but in variety almost infinite, and such as to demonstrate, far more forcibly than words can possibly depict, the activity and the keenness that prevail in every ramification of the gas industry. If there is one thing more than another to be learned from this comprehensive and surprising display, it is that the belief expressed by Mr. Jones as to the future of the industry rests upon much more solid foundation than is generally the case with anticipations of this description. Mr. Jones, in acknowledging the compliment paid to him at the conclusion of the banquet, predicted a future for the industry in comparison with which its past and present would appear as nothing. True, the same thing has been said before, and by those who have had equal opportunities with Mr. Jones of observing the trend of events, and who have been equally unswerving in their allegiance to gas as ordinarily manufactured. But never has it been done so forcibly as on this occasion. We gladly welcome this declaration as an earnest of something more substantial; for some possible sufferers from the Mond eruption may be tempted to exclaim:

> "Perhaps it was right to dissemble your love,
> But—why did you kick me down stairs?"

It is particularly gratifying to be able to record here the fact that on the opening day the guard of honour thoughtfully provided by the management, and consisting of two hundred or more Reservists from the various Metropolitan and Suburban Gas-Works—many of whom wore medals indicative of having been on active service—were in great requisition, so numerous was the throng of visitors. This speaks well for the interest which the exhibition has undoubtedly excited, and which it is to be hoped will bear fruit in the shape of a satisfactory day-by-day attendance. Everyone engaged in gas manufacture should—and it is believed will—make a point of visiting this truly unique display; but something more than this is desired. Gas makers wish to enlist the sympathy of the public; and with this object in view, every effort should be made to bring all and sundry to see what gas can and may do for them.

The banquet which followed the inspection and formal opening of the exhibition, was a conspicuous success. Mr. Jones, as President of the Exhibition Committee, fitly and fittingly occupied the chair. He was supported on his right by the Right Hon. the Lord Mayor of London, and on his left by Mr. D. Irving, as President of the Institution of Gas Engineers. The company was distinguished and numerous; the speeches were excellent and just to the point—Major-General Moody with his reference to the Naval Reserve which is in course of formation from among gas-works stokers, and Colonel Sir W. T. Makins, with his historical retrospect. It was, perhaps, a little hard on the latter that the very important toast of "Municipal Institutions" had no special reference to the history of gas lighting, though had it been the Chairman of the London County Council who was called upon to respond, the reference might have seemed much more pertinent. Colonel Makins, however, did excellent service by placing before his hearers some figures illustrating the recent growth and progress of the gas industry.

Perhaps the palm for the evening should be awarded to Mr. Sheriff Strong, who made an admirable speech in proposing "Success to the Gas Industry," not more from an oratorical point of view than for the weighty and unbiassed testimony which he delivered in favour of gas—speaking, as he said, neither as director nor shareholder, nor as having any direct interest in gas other than that of the "man in "the street." The Lord Mayor of York spoke in the same strain; and it is clear that at the bar of public opinion, as represented by these speakers, the gas industry has nothing to fear. A well-merited compliment was paid to Mr. Helps, who, as Chairman of the Advisory Committee, has been indefatigable in promoting the success of the exhibition, and to Mr. C. Clare, the Chairman of the Exhibitors' Committee. The formation of the latter has been attended with excellent results in the smoothing away of difficulties which are inherent to an undertaking of this description. It has enabled the voice of the exhibitors to be heard on all matters in which they are concerned. They are the men entitled to this, since it is on their shoulders that the burden of success or failure principally depends; and theirs is the stake at venture. Both Chairmen expressed their indebtedness to each other's assistance, and bore testimony to the unanimity which has all along prevailed between the two Committees, and also to their obligation to Messrs. Bridges and Smith, the Organizing Managers, who are deserving of all praise.

Everybody concerned may, in fact, be heartily congratulated on having worked in thorough harmony with but one object in view. That object they have secured beyond a doubt. A splendid success has been achieved in the gathering together of a wholly unique display of gas appliances. The rest does not depend so much upon them as upon the general public. Will the attendance be such as to recompense the exhibitors, and spread abroad the capabilities of gas? As has already been said, it should be the task of everyone connected with the gas industry to bring visitors to the show. We hope to return to the subject of the exhibition and its lessons. In the meantime, it only remains to say that due recognition should be made of the public spirit shown by the Institution of Gas Engineers for their initiation and encouragement, without which, it is freely acknowledged, the exhibition could not have been what it is. That this should have been one of the first acts of the reunited body speaks well for the future of the now truly National Institution. It may also be remarked that, huge as the exhibition is, and adequately as it may represent the various industries which are dependent upon gas, abundant proof has lately been afforded, in the additional applications received for space, that it might have been made far larger had more time for preparation been possible, and had not, also, misgivings been entertained in some quarters as to its probable success.

Gas Legislation for the Metropolis.

AMONG the Parliamentary Notices which have appeared is one from the Gaslight and Coke, South Metropolitan, and Commercial Gas Companies, who notify their intention to apply for a Bill to repeal or amend their Acts with respect

to the method of testing the illuminating power and purity of the gas supplied by them, and to prescribe the nature of the burner and apparatus to be used for the purpose of testing the illuminating power of the gas, and the manner in which such burner and apparatus shall be used. Also to repeal any statutory provision in force affecting the three Companies with regard to the removal of sulphur compounds other than sulphuretted hydrogen; to repeal or modify any statutory provisions affecting them which require the gas to be wholly free from sulphuretted hydrogen; and to make provision with respect to the limitation of the amount of sulphuretted hydrogen in gas supplied, and to the method of testing for the same; to amend the existing statutory provisions in relation to the three Companies as regards forfeitures in cases of deficiency in the illuminating power or quality of gas or the pressure at which it is supplied; to enlarge the powers of the Chief Gas Examiner; to provide for the hearing by him of applications for the recovery of forfeitures in respect of illuminating power, purity, or pressure, and for the determination by him of the amount (if any) to be paid by the Company in default; and to provide that, in the event of any difference between the three Companies, or any of them, and the Gas Referees as to the reasonableness of any requirement of the latter, or as to compliance therewith, the decision of the Chief Gas Examiner shall be conclusive. It is also proposed to make new provisions with respect to the times for testing the gas, to discontinue testing on Sundays, and to remove any obligation to test daily on other days—leaving it optional with the testing authorities to test on any day other than Sunday, and to provide that in cases where any defect is found or alleged to exist in illuminating power, quality, or pressure of gas, notice shall be given by the testing authority to the Company concerned.

It will be seen from this that our anticipations of last week have been realized; and that the Companies are agreed upon the terms of a Bill which, if successful, will secure to them the full measure of freedom recommended in the report of the Departmental Committee of the Board of Trade on Gas Testing in the Metropolis. The notice goes somewhat further than these recommendations, which is, in fact, necessary in order to cover certain matters not considered in the recommendations. It may be regarded as indicating the amendments to existing Acts which, in the opinion of the Companies, are necessary for the obtaining by them of the same liberty of action which is, and has always been, enjoyed by the largest gas undertakings elsewhere in the United Kingdom. As to this, it will bear repetition that what is sufficient for Birmingham, Manchester, or Glasgow, should be good enough in London. It is an anomaly, to say the least of it, that fetters should continue to be imposed upon the Metropolitan Companies which are not considered necessary by any self-governing community having the control of gas supply.

As a fitting corollary to this comprehensive proposal, the South Metropolitan Company intimate their intention to apply for leave to introduce a Bill to provide (among other things of purely domestic concern) for the retirement and compensation of the Gas Referees. This, again, will meet with the sympathy of the whole of the gas industry; it being impossible to understand the continuance in office of an authority whose functions—in so far as these may not have lapsed into sinecurism—have brought it into conflict with progress. When the recommendations of the Board of Trade Committee become legalized by this combined action of the three Companies, and the methods of testing for illuminating power and purity are defined and legalized, there will be nothing left in the matter of supervision but what can be efficiently performed by a Chief Gas Examiner; and there can be nothing in the conditions of the gas supply of London to justify the retention of any other authority.

The London County Council appear to have thought better of their intention to promote gas legislation on their own account, since no notice from them has made its appearance. The South Suburban Gas Company, however, have given notice of their intention to apply for leave to introduce a Bill to alter their existing provision with respect to the quality and illuminating power of the gas to be supplied by them, to relieve the Company from their existing obligations with respect to the removal of sulphur compounds other than sulphuretted hydrogen, and to repeal the provisions of the Acts with respect to the removal of such sulphur compounds. There are other provisions of the proposed Bill which are of less general interest. It will thus be seen that, whatever may be the prospects of the coming session with regard to gas legislation generally, it promises to be a busy and highly important one in connection with the Gas Supply of the Metropolis.

Municipal Indebtedness.

Attention is directed in another column to two speeches on the above subject—one delivered by Sir Henry Fowler, M.P., and the other by Mr. Spencer Phillips, as Chairman of Lloyds Banking Company. As was to be expected, each of these speakers views the case from a different standpoint; but the burden of both is the same—namely, that municipal indebtedness "has increased, is increasing, and "ought to be diminished." This quite accords with the views which have of late been frequently expressed in these columns, more particularly with regard to what is commonly known as municipal trading. There can be no reasonable excuse for piling up municipal debt by embarking in trading ventures of a more or less doubtful remunerative or useful character—such, for example, as electric lighting, especially for small towns where there is little or no demand for it. Electric lighting at best is not the light of the million; and to pledge the credit of the whole community for what is often but the luxury of a few, is neither just nor reasonable. We may go a step further, and question the wisdom or expediency of entrusting an electric light undertaking to any local authority which has not also the gas supply; for under such circumstances it is difficult for it to steer clear of unfair competition with a gas undertaking in private hands, or hold the balance evenly between the two illuminants, where the public service is concerned.

It may also be urged that there is now much less reason than formerly for the gas supply to be in the hands of the local authority, seeing that gas no longer holds the field as the only distributed source of light and motive power. But for any unwise expenditure incurred by local authorities the Local Government Board must be held to be partly to blame, because their authority and approval is necessary for any expenditure on what may be called "capital account;" and their control is of little value if it be not effectively exercised. Apart, however, from any consideration of this kind, it is clear that the stringent condition of the Money Market calls for the exercise of prudence on the part of local authorities. Expenditure which may appear justifiable when loans can be obtained at $2\frac{3}{4}$ or 3 per cent., bears quite a different aspect when 4 per cent. has to be paid; and this leads to the observation that for much of the municipal expenditure—whether good, bad, or indifferent—during recent years, the plentiful supply of money prior to the last two or three years is to a large extent answerable. But when all is said and done, and admitting to the full that some local authorities have overstepped the bounds of prudence in this regard, what is there to justify the present outcry against that which is denounced as municipal extravagance?

This inquiry, it need hardly be said, has no reference to the speech of Sir Henry Fowler, who is an experienced and enlightened economist; but Mr. Phillips's somewhat sarcastic references to the varied forms of municipal enterprise—unmindful of the fact that a Director of Public Companies not seldom in his time plays many parts—have incited a portion of the London daily press to hysterical utterances, which are highly suggestive of utter want of appreciation of the public spirit which animates municipal work throughout the country. They may be suitable enough for the emotional readers for whom these papers cater; but that our staid contemporary, the "Engineer," should be found in such company is altogether amazing. According to the "Engineer," one of the most potent causes of present indifferent or bad trade is the "enormous indebtedness "of the municipalities. Rates and taxes have become a "heavy burden, telling against the prosperity of the towns "implicated. But the principal point for consideration "is that the available wealth of the country has been "invested in what are very largely non-remunerative "undertakings. The ready money, the loose cash of the "community, has been swallowed in providing people's parks, "magnificent town halls, tramways, and electric lighting "schemes that do not pay, and so on." What nonsense! The article does not state how much has been expended on "people's parks;" but we venture to say that no reasonable person is likely to grudge it whatever be the amount. The

provision and the preservation of open spaces for the recreation of the masses of the people are duties to humanity, of the reasonable fulfilment of which any community may feel proud. Nor is it any clearer with regard to the "magnificent town halls," which, but for the ill-natured reference to the fine City Hall of Glasgow, might pass for the phantom of a disordered imagination. Anyhow, it is certain that no one—unless it be our contemporary—is likely to grudge Glasgow its splendid emblem of civic dignity and importance; nor will anyone be found equal to the task of connecting the erection of it some years ago with the present depression of the shipbuilding industry, not on the Clyde only, but throughout the country.

There remain the investments in tramways and electric lighting schemes, which, according to another authority, amount to about £26,000,000. Assuming the whole of this to be unremunerative, which is certainly not the case, how is it answerable for the present stagnation of trade? The ratepayers may have to pay for it in the shape of increased local rates. But has it ever been properly considered how to the ordinary householder an increase of even as much as 2s. in the pound in local rates compares with a rise of 4d. or 6d. in the income-tax, without regard to other indirect war taxation? And what about the "unremunerative" expenditure on the South African War? This amounted to about 230 millions, or about nine times the expenditure on tramways and electric lighting. In reality, it is not local, but Imperial taxation that has proved so burdensome during the last few years, and reduced the spending power of the nation. It is not so much local as Imperial expenditure which during the last few years has absorbed the "ready money, the spare cash of the people," and diverted it from remunerative enterprises. We are not finding fault with this expenditure, far from it. But surely if there is anything in the argument about bad trade being caused by the diversion of money into unremunerative enterprises, it must apply with manifold force to the expenditure on the South African War. What the country is suffering from at the present time is, not extravagant municipal expenditure, but the inevitable reaction. The huge expenditure that was necessary during the prosecution of the war, causing activity in trade, has ceased, and peaceful trade has not yet "followed the flag."

While, therefore, viewing with distrust the growing tendency of local authorities to embark in trading enterprises, and desiring that some curb should be imposed upon them in this respect, we can have no sympathy with a criticism which is based on ignorance, and is partly malevolent, and to a great extent unreal. It is a relief to turn to the sensible observations on the subject which were made by Lord Welby in a recent interview. Lord Welby is opposed to both Imperial and municipal indebtedness, but realizes the necessity for both; for insurance, on the one hand, of our national existence and prosperity, and, on the other, of the health and well-being of the communities that comprise the nation. He would, however, like to see a limit placed upon municipal indebtedness—say, of two-and-a-half times rateable value; but it is not clear whether this is to include water and gas undertakings. Unless these be excluded, such a limitation is likely to apply very unequally, since some local authorities possess both, others only one, and others, again, neither. It will be gathered, however, from what has already been said, that a limitation of the objects for which expenditure may be incurred is most likely to effect the desired result.

The Saltley Explosion.

THE proceedings at the adjourned inquest, on the 14th inst., which are reported elsewhere, on the unfortunate victims of the explosion at the Saltley Gas-Works, resulted, as was generally anticipated, in a verdict of "Accidental death," without further remarks by the Jury. No other verdict was, indeed, possible under the circumstances, since, according to the evidence, the plant and appliances were all in perfect order and repair. Contrary, however, to expectations, no additional light was thrown upon what may be termed the primary cause of the explosion—namely, the reason for such an excessive pressure in the purifier as to force the gas to escape through the lute. That a purifier should occasionally "blow," seems, in fact, to have been almost regarded as an ordinary incident of gas manufacture; and attention was mainly directed to the construction of the safety lamp which was assumed to be directly answerable for the ignition of the explosive mixture. This assumption receives some support from the fact that the poor man Jordan was found to have been badly scorched about the head and upper part of the body, though this might be easily accounted for by his close proximity to an enormous body of flame. The question naturally arises as to how it was that he and the men who were with him did not suffer to a greater extent than they appear to have done from the actual effects of flame, if, as is supposed, they walked right into an explosive mixture and set light to it. Moreover, the two survivors of the explosion do not seem to have been questioned as to what was the condition of the atmosphere, either in proximity to the valves which they attempted to rearrange, or at the distance from them at which they were when the explosion occurred. If this had been highly charged with gas, they must have been in some danger of asphyxiation, or at all events have suffered inconvenience during the ten or twelve minutes they were in the purifying-house. It may be remembered, moreover, that, gas being much lighter than air, the tendency would be to form an explosive mixture first (except in the immediate proximity of the purifier that was blowing) in the upper part of the building, and that the existence there of such a mixture would not be inconsistent with a pure atmosphere away from the region of the escape, at the height at which a safety lamp would ordinarily be carried, or even at that at which a man would breathe.

However, whether or not the view that the safety lamp may have been the cause of the ignition be accepted, and whether or not this was subjected to conditions which would, in the opinion of Professor Redmayne, have rendered it unsafe, it is clear that the observations of the latter on the construction of this particular form of lamp are deserving of most careful consideration. It is of no use—in fact, it may prove worse than useless—to rely upon a safety lamp which is not as reliable as science and experience can make it; and whoever does so hereafter will take upon himself a heavy responsibility. This is not said with any idea of passing judgment upon the form of lamp employed at the Saltley Gas-Works, which, in fact, was admitted by Professor Redmayne to have some very good points. It is, unless we are much mistaken, of a kind which is usually found in gas-works. But it has been made clear that no precaution should be neglected in order to ensure the greatest amount of security under conditions which may render the use of a safety lamp necessary. It was stated by Professor Redmayne that safety lamps for mines are limited to 1½ inches in diameter. Such a lamp can hardly be made to afford any great amount of light; but better this than run the risk of disaster. Night operations in purifying-houses should be of rare occurrence. If purifiers are overtaxed, they no doubt require careful watching by night as well as by day; but this condition of things should be altered as speedily as possible by the provision of additional plant.

Another lesson to be learnt from this sad disaster—if it had not been learnt long ago—is that purifiers should not be enclosed in a brick building. The more open they can be—consistently with affording sufficient screen from the weather for the workmen—the better. A further point is that water-lutes may with advantage give place to what is commonly known as Green's system of luteless lids, although Mr. H. E. Jones rightly claims to have been, equally with Mr. Green, one of its first users. In connection with this, it is necessary for safety to employ a water-seal which will "blow" when a given pressure is reached. Such seals are, indeed, frequently employed in connection with purifiers having water-lutes, being adjusted to "blow" at a pressure somewhat less than the water-lute of the purifier is capable of withstanding. There does not appear to have been one of these in connection with the Saltley purifiers.

History Repeats Itself—An Early Gas Exhibition

The great event of the past week to which so large a portion of the present issue of the "JOURNAL" is devoted, may possibly recall to the minds of a few of our older readers one of a somewhat similar, though less pretentious, character, held in the early years of the history of this publication, when the strongholds of the gas industry were threatened with invasion from various quarters—when, in fact, they had already been invaded in the Metropolis by an attacking army, in the shape of a "cheap gas"

Company, located on its eastern borders. No doubt for some reason which was considered at the time to be perfectly sound, the Council of the Great Exhibition of 1851 decided to exclude every kind of gas apparatus in action from that wonderful glass structure in Hyde Park which attracted the whole of the civilized world. Even in what are now regarded by some as the apathetic days of the industry, it was not to be supposed that those who were prominently engaged in it would sit quietly down under so undoubted a slight. They very properly felt that efforts should be made to place before the public a representative collection of appliances in what they rightly regarded as a most important branch of industry in this country. A Committee composed of the leading gas-fitters in the Metropolis was accordingly formed to carry the project into effect. Gas companies, coal-owners, and others interested in the progress of gas lighting, were solicited for assistance; and thereby a fund amounting to nearly £600 was placed at the disposal of the Committee. The subscription list was headed by the Imperial Gas Company with £100, followed by the Chartered and London Companies with £50 each; the other Metropolitan Companies contributing sums of £30 (City of London, Equitable, and Great Central), £25 (Western), and £20 (South Metropolitan). Representatives were sent from the principal subscribers; and they, conjointly with the original Committee, formed the Committee of Management. The exhibition was held in one of the halls of the Royal Polytechnic Institution, Regent Street, which was placed at the disposal of the Committee by the Directors of that Institution. Lectures were delivered by well-qualified gentlemen; and practical demonstrations were given in cooking by gas. At the close of the exhibition, the Committee were left with a surplus of £109.

And Its Results.

It will now be of interest to record what was done with the surplus. The Committee caused lectures to be delivered at certain Metropolitan institutions on the use and advantages of gas, the expenses attending which amounted to £32 10s. 8d. Arrangements were made with Mr. Lewis Thompson—the "Man in Pancras Lane," who in those early days was so doughty a champion of gas, and whose caustic criticisms were then a conspicuous feature of the "JOURNAL"—to write a prize essay on the subject; and 5000 copies of it were distributed *pro ratâ* to the subscribers. The expenses attending the production and circulation of this essay came to £67 1s. 5d.; and miscellaneous items of postage, &c., brought the amount up to £76 14s. 7d. All the money contributed was judiciously spent; and at the conclusion of their labours the Committee thanked the subscribers for the "liberal sum" placed at their disposal, and the exhibitors for "the many elegant and ingenious apparatus and models entrusted to their care." In the action they took in this matter, the Committee did not presume for one moment to question the propriety of the decision which excluded gas apparatus in action from a building in which "every other branch of industry found space for representation." At the same time they did not fail to record their gratification that the same "indomitable spirit" which had made gas lighting "a purely English invention and pursuit"—which had carried English coal, iron, engineering talent, and capital, to illuminate the principal cities of the world—had also enabled gas, and the apparatus for its varied applications, to take some part in the glorious demonstration of 1851. May those who initiated and have carried out the splendid display at Earl's Court find themselves in a position to report with even greater gratification than their predecessors the results of their arduous labours in the cause of what may still be justly described as "one of the most important branches of industry in the country."

The Old Fog Trouble,

The advent of November has brought with it the attendant trouble which Englishmen have for many years had only too good reason for associating with it; and, as a consequence, fog was very much in evidence last week. Curiously enough, the subject was discoursed upon on Wednesday evening, at the opening meeting for the current session of the Royal Meteorological Society, by Mr. F. J. Brodie, who put forward the opinion, based on statistics, that fogs are becoming less frequent every year in London. As if to show, however, that they had not departed entirely, our old friend (or foe) appeared in considerable force next day, in order to give the Royal visitors from Portugal a sight, and possibly a taste, of the climatic conditions characteristic of our island about this season—an experience which no doubt gave rise to a feeling of gratitude that their lives are passed in a different atmosphere and under serener skies. To return, however, to Mr. Brodie, he told his colleagues in the Society that whereas from 1877 to 1891 the Metropolis was visited by fogs seriously above the average in number, since the latter year there has been an equally marked decrease; the minimum or best year being 1900, and the second best 1903. In explanation of the reduction in the number and intensity of London fogs, he referred to the many ways in which "the smoke fiend" had been attacked. He spoke highly of the work of the Coal Smoke Abatement Society, and said the introduction of improved forms of stoves and grates, which permit a more perfect combustion of the fuel, was a factor in the reduction of the evil. But another potent agency was the more general adoption of gas-stoves for heating and cooking; while the displacement of the old-fashioned gas-burner by incandescent gas and electric light had helped materially to bring about the improved conditions recorded.

And the Way to Deal with It.

Another authority on the smoke question, however, seems rather more optimistic than Mr. Brodie, though he is far from promising immunity. In the course of an interview with the representative of a London evening paper last week, Sir Oliver Lodge, the Principal of the Birmingham University, expressed the opinion that the method he has devised for dealing with sea fogs—viz., driving electricity, at high voltage, through barbed wires, into the fog-filled atmosphere—may be employed as a palliative in the case of town fogs, though he fears the cost would be prohibitive. He has much greater faith in another remedy more easily applicable. "Get rid," he says, "of the primary cause of town fogs—*i.e.*, the open grate—and then we shall have no fogs." In the language of the schools, "*Sublatâ causâ tollitur effectus.*" But what are we to substitute for the grate, in view of the difficulty that exists in getting the Englishman to go without his coal fire? Sir Oliver would win him over to gas as a heating and cooking agent, and to electricity as an illuminant; and he would use it as a substitute for a large proportion of the steam power now employed. But when he talks of gas, it is not the "gas of commerce," so to speak, to which he refers. "What we want," he says, "is gas of a lower strength—a lower calorific value—than the present coal gas; and it should be made at the mouth of the coal pit." The latter condition, however (which, by the way, is not new), he does not regard as an absolute essential of his idea, though he considers it very desirable. Questioned on the subject of price, he said he thought gas of the quality he had in mind could be made and delivered at a cost of 6d. per 1000 cubic feet; and it would suffice for heating and cooking. If required for use as an illuminant, it could be enriched by means of hydrocarbon oils, as is now done in the case of water gas, and burnt by the aid of mantles. Sir Oliver did not enlarge upon this point of enrichment; but as it would be impracticable to supply two kinds of gas—one crude and the other enriched—it may be presumed that he contemplates enrichment on the consumer's premises. The gas he suggests is not that produced by the Mond process, as one might suppose, from his proximity to the headquarters of the exploiters of this process, but "something between the two." His idea is that the raising of the load-line of distribution would reduce the cost of production; and he is convinced that "when the housewife is assured that the use of gas is cheaper than coals, it will not take long to convince her of its greater cleanliness and healthiness." Pending the supply of gas approaching the quality mentioned by Sir Oliver Lodge—and this may take place at a period less remote than he contemplated—the housewife referred to would do well to turn her attention to the capabilities of the commodity now at her disposal, as demonstrated at the International Gas Exhibition at Earl's Court. There she will see how the "cleanliness and healthiness" upon which Sir Oliver Lodge laid stress may even now be secured. By acting promptly, she will not only swell the ranks of the rapidly growing army who, by means of the gas-stove, are attacking the smoke nuisance, with the view of minimizing its attendant fogs, but also help to make up any deficiency in the revenue of gas undertakings resulting from the existence of changed conditions which would be unquestionably beneficial to the public at large.

THE INTERNATIONAL GAS EXHIBITION.

EARL'S COURT.

NOVEMBER 19 to DECEMBER 17.

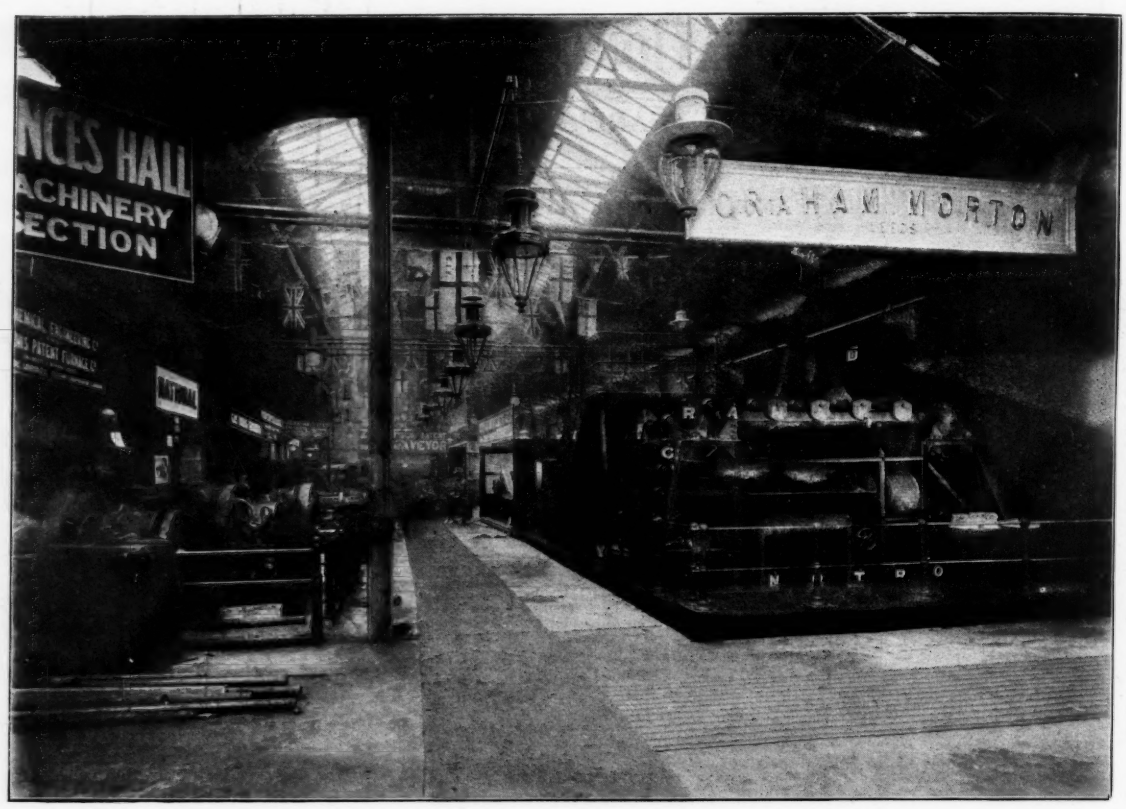
THE ILLUMINATION DEVICE (40 FT. BY 12 FT.) OVER THE WARWICK ROAD ENTRANCE, MADE AND SUPPLIED WITH GAS BY THE GASLIGHT AND COKE COMPANY.

(*Photo. by Mr.* P. F. COGGIN, *one of the Company's Officers.*)

NOTES AT THE FORMAL OPENING BY THE LORD MAYOR.

A MAGNIFICENT SUCCESS. This was the verdict, single and unqualified, at Earl's Court on Saturday evening. Expectations have materialized in pronounced form; and, as a spectacle, regarded either from the points of view of magnitude or quality, the exhibition is without parallel in the annals of the gas industry. Gas manufacture and utilization, and in both economy combined with active force in performance, are represented opulently and convincingly from one extreme to the other in the main course, and in the several branches; and all at evening time in an effulgence, rich and clear, and matchless for the time being in any other centre. Only a few days before the opening, chaos reigned. Carpenters, gas-fitters, and decorators in multitude governed the place; their hammers and other tools were creating a din which was not as music to the ear untrained in the operations accompanying the transition from such confusion to order. But willingness, good humour, and day and night labour prevailed against what appeared to be an almost unyielding resistance. The spirit of exertion which has kept Mr. James W. Helps and his Advisory Committee, Messrs. Bridges and Smith (the Managers), and the contractors and manufacturers working at high pressure to attain success, entered into the workers who were to give final form and arrangement to the effort and plans of the organizers and exhibitors. The result was that never within our knowledge has an exhibition of any kind of similar magnitude presented such completeness, with so comparatively few exceptions, as did this one on Saturday night. Moving machinery, intermingled with heavy inanimate plant, was to be seen in abundance, representing the manufacturing side of gas production; large stands, carpeted and furnished, and strikingly illuminated, had upon them and suspended over and around them the heavier and lighter goods of utility of every conceivable kind, demonstrating the depth to which gas has penetrated into the domestic economies and conveniences, and to such extent that it is now an unrivalled necessity, and not only so, but has its attendant decorative influence in the home through its accessories; numerous other stands with equal effect displayed the many latter-day methods of applying gas to the illumination of our public spaces and ways; again, others were demonstrating the employment of gas as a valuable and efficient agent for power and in other industrial occupations; and, beyond, there were the illustrations of the branch industries from the great main one. Over all were the high-power and intensified gas-lights adding to the life and lustre of the scene in all the large halls. There were few blanks; and there was a satisfying presentation of completeness all around. By this time even the then small amount of backwardness must be a thing of the past. Therefore to the Saturday night's chorus of approval and congratulation to all concerned—the Committee, the Organizing Managers, and the Exhibitors—we heartily unite our own. No one associated with the gas industry, we say without hesitation, can afford to miss the exhibition.

Just before half-past five in the evening, passing in at the main entrance in the Warwick Road—over which, by the way, is the gigantic illumination device (one of the notable contributions of the Gaslight and Coke Company), measuring 40 ft. by 12 ft., and consuming every hour about 15,000 cubic feet of gas supplied at



PRINCE'S HALL—MACHINERY SECTION.

high pressure by means of the Millennium plant—there were found the President of the Exhibition (Mr. H. E. Jones), the Chairman of the Advisory Committee (Mr. J. W. Helps), and the members of the Advisory Committee, with several other prominent men of the gas industry. Running from this point, and keeping a clear path winding round into the Ducal Hall were two ranks of Reservists, who had—young and old—seen active service, and are now engaged in gas-works. Smart cordons they made—men to the backbone, well set up, active, retaining all the influence of their military discipline, and answering with swiftness and almost mechanical action to the words of command that passed down the corridors. They formed the guard of honour; and in their disposition Mr. A. W. Onslow, of the Woolwich Arsenal Gas-Works, was taking a prominent part. The men numbered between 200 and 250; and contingents came from the Woolwich Arsenal Gas-Works, Mitcham, South Suburban Company, Redhill, Brentford, Tunbridge Wells, the Gaslight and Coke Company, Reading, West Ham, Croydon, and Wandsworth. The Gaslight and Coke Company sent the largest contingent—about 100. (All the men were, at the conclusion of their duties, entertained at dinner.) Behind their ranks, and throughout the buildings, the public was already strongly in evidence—taking an interest in all that was passing and, to a by no means slight extent, in the exhibits. This is highly gratifying.

Returning to the main entrance, the reception party awaited the arrival of the Lord Mayor (Alderman John Pound) with an excitement that could not be sufficiently suppressed to be concealed. Every approaching vehicle—a parcels delivery van included—caused a craning of necks; and even the coming of his Worship the Mayor of Chelsea from an altogether different direction, wearing his badge and chain of office, caused a little stir—one wit remarking, and producing commotion and even attempts at cheering among some who did not know the Lord Mayor's distinguished figure, "Here he comes; he has got in another way." But the suspense ended soon after the half hour. Punctuality is evidently, and very properly, one of the traits of London's new Lord Mayor. The carriages bringing him, the Sheriffs, and the other gentlemen composing his suite arrived almost precisely to time; and then, with proper deportment, Mr. Jones and the members of the reception party advanced, amid cheers, into the vestibule, and welcomed the civic dignitaries. The Lord Mayor had in his train the bearer (in gold-embroidered gown) of the emblem of his high office, and his powdered and liveried attendants. A procession was immediately formed, headed by the Lord Mayor, with Mr. Jones and Mr. Helps as his cicerones; and the tour of the extensive exhibition buildings was at once commenced.

There was over an hour before dinner; but the inspection at first looked as though it was going to develop into something approximating a quick march past. Through the Machinery Hall the Lord Mayor was taken; but not a stop to explain to him the nature and the purposes of the plant on view. Then away down the corridor leading into the Ducal Hall. It was a pity that the Pharos light—the newest to this country of the high-pressure systems—was not in working condition at the time, although it was later in the evening. At the entrance to the Ducal Hall, Mr. John Glover (of Messrs. Thomas Glover and Co., Limited, and R. & A. Main, Limited) asked the Lord Mayor's acceptance of a gold medal, in silk-lined case, which the firm have had specially struck—and bronze facsimiles of which were freely distributed—commemorating indestructibly the exhibition. The little incident gave his Lordship pleasure. The party moved on, now with a lengthy queue formed by the general public. They traversed the paths between the spacious stands tenanted by splendid examples of gas cookers, fires, and other stoves of many and varied types, glancing only at the exhibits in passing; then away down the Queen's Palace Annexe between bordering lines of general exhibits into the extensive Queen's Palace, all round the sides of which are stands, between which are two longitudinal central lines. Apparently it was found that time would not be fully expended before dinner if the hasty inspection was continued; and so the Lord Mayor was, clearly, much entertained and interested by making a more intimate acquaintance of the numerous exhibits.

Meanwhile, in a temporarily covered building in the Winter Gardens joining the Ducal Hall and the Queen's Palace Annexe, the crowd had thickened; among them being noticed several gas engineers, some of whom are members of the Council of the Institution, who, by-the-by, were not prominently represented other than by the President (Mr. D. Irving) and the Advisory Committee in these inaugural proceedings. On one side of this place is a band-stand; and before it a space had been fenced off by chairs to give a limited amount of seating accommodation, for hearing the formal declaration of opening by the Lord Mayor. The Secretary to the Advisory Committee (Mr. Webber) was in charge of this space. An honoured arrival was the Governor of the Gaslight and Coke Company, Sir William Makins, Bart., who was accompanied by Lady Makins; and to them the Secretary was most assiduous in his attentions. The chief officials of the Gaslight and Coke Company have been working hard over the exhibition; and the General Manager (Mr. D. Milne Watson), the Secretary (Mr. H. Rayner), and the chief of the department in charge of the Company's business beyond the mains (Mr. F. W. Goodenough), whose work at Earl's Court has been energetic and most helpful to Advisory Committee and exhibitors alike, put in an appearance here. The band of His Majesty's Scots Guards also took possession of the band-stand. Soon after, the Lord Mayor and his companions returned; and the principal participants in

View in the Ducal Hall—Gas-Stove Section.

the important function of declaring the exhibition open ascended the little platform which had been constructed for the purpose.

Mr. Jones, at once addressing those present, said the exhibition which they had asked the Lord Mayor to open was the outcome of a desire on the part of the Institution of Gas Engineers last year (he happened then to be the President of that body) that they should gratify their aspirations to have an exhibition not only illustrating the uses of gas but one also illustrating the developments in the manufacture of gas and the scientific side of gas. Primarily, the parties would not have much to say to an exhibition merely of lights and stoves; but on every side it was felt that, if an exhibition could be held in London, it should be on a decidedly scientific basis. Therefore this exhibition, unlike some exhibitions, was actually the outcome of, and the motive of it was furnished by, the desire of the Institution to give an exhibition which should do justice to the great industry of gas, which they were all engaged in promoting. There was a special fitness in the Lord Mayor of London condescending to come and open the exhibition, because they claimed that they gave to the working class comforts in the way of lighting, cooking, and heating which they did not formerly enjoy, and had illustrated that they could light the City's Tower Bridge and other great places in a manner by gas which defeated all possible competition either in volume or cost of light. In these ways, they, as gas suppliers, were performing a municipal service. They had therefore been emboldened to ask the Lord Mayor to open the exhibition; and he had very kindly responded to their wishes. He would now call upon him to express his disposition to open the exhibition.

The appropriate remarks of the President drew the applause of the large audience; but, in point of brevity, the Lord Mayor outdid Mr. Jones.

The Lord Mayor: Mr. President and gentlemen of the Committee, I thank you heartily for having given me the opportunity of being present here to-day. It has been somewhat startling to me to see, during the three-quarters of an hour I have been walking round these buildings, the astonishing strides that engineers have made in connection with gas supply. I again thank you heartily for giving me the opportunity of being present; and I now declare this exhibition open.

Enthusiastic cheers followed, and the Guards played "God Save the King"—the audience all standing. Three hearty cheers were raised for the Lord Mayor; and the Gas Exhibition was now fairly launched on its career. That it will be a successful one, and that it will have a beneficent influence on the gas industry, there is not now a shadow of doubt.

At the Dinner.

The event was later commemorated by a dinner, at which about 300 were present. The President, Mr. H. E. Jones, was in the chair; and on his right were the Lord Mayor, and on his left Mr. D. Irving, the President of the Institution. The other guests included Sir William Makins, Bart., the Lord Mayor of York (Mr. R. H. Vernon Wragge), Cav. F. F. Righetti, Acting Consul-General for Italy, the Consuls of one or two other countries, Sheriffs Strong and Woodham, the Mayors of Paddington, Chelsea, Finsbury, Hammersmith, Kensington, Fulham, Bethnal Green, and St. Pancras, Mr. Charles Hawksley, Major-General Moody, the Hon. A. Dobson, the Chairman (Mr. J. W. Helps) and members of the Advisory Committee, the exhibitors, including the Chairman of their Committee (Mr. C. Clare), and several others who had assisted in the work of organizing the exhibition. The occasion was brought into association with distant parts of the Empire by the presence of Mr. John Coates, of Ottawa, and Mr. R. O. Thompson, of Melbourne.

After dinner, toasts suitable to the occasion were duly honoured; being interspersed by songs by Miss Leslie Lulu, Mr. Samuel Masters, and Mr. R. A. Pollard. The large company having shown their loyalty, the President gave the "Army, Navy, and Reserve Forces."

Gas Workers as Reservists.

Major-General Moody, replying to the toast, said he should like to say what gas could do for the navy. So far as the navy was concerned, they had got to the end of their tether in regard to active service. After manning all the ships under commission, they had a great number of other ships in reserve. They sometimes wanted men to go aboard these ships, and man them as quickly as possible in cases of emergency. A naval emergency meant a great expense to the country. Now in the gas-works of the country, they had 65,000 stokers; and it had been his privilege in the last year to go round to most of the big gas-works, especially the coast ones, and see these men. And a more magnificent body he had never seen. (Cheers.) If a sculptor wanted a model of a British working man—he was going to say almost giants—he should go round and see what was to be found in the gas-works of the United Kingdom. The Admiralty, hearing of these men, had made them a liberal offer—a very fair offer, which appealed to men who were, through the lengthening of the days, thrown out of work in the summer time. By the help of chairmen of committees, chief engineers, and officers generally—especially foremen—the men had come forward very well indeed. He believed that in the year they had had something like 1000 of these men who had volunteered for the Royal Naval Reserve. This looked a large number. But he believed about 8000 were really wanted; and they would be obtained. The men had given great satisfaction; and when they returned (he had seen a lot of them) they spoke of naval stoking as being child's play compared with gas-retort stoking. This was very gratifying; and he hoped that everyone would encourage the men to come forward. There had been little hitches at first. But these would all pass away; and in future years the whole thing would go almost automatically. Coming to the army, he said it had been a grand sight to see the army reservists employed in gas-works doing duty at the exhibition that night. They formed a guard of honour to the Lord Mayor; and during his year of office, he would not find a

SECOND VIEW IN THE DUCAL HALL—GAS-STOVE SECTION.

more distinguished body of men doing such service than he had seen that night.

Applause followed the gallant gentleman's remarks.

MUNICIPAL INSTITUTIONS.

Col. Sir WILLIAM MAKINS, Bart., said the Committee had entrusted to him the toast of the "Municipal Institutions of the United Kingdom;" but, if he might take a great liberty with it, he should like to make it the "Municipal Institutions of the Empire," because not only had they the municipal institutions of the United Kingdom, headed by the magnificent and venerable Corporation so ably presided over by the right honourable gentleman on his left, but throughout the British Empire—consisting of lands in every continent and isles in every sea—where there was a community large enough to have one, there was a corporation or a municipal body based exactly on the lines of the Corporation which was at the head of them all. These corporations stood for the freedom of Englishmen all over the world; and they stood for the representation of every man. Some of these municipalities were the possessors of gas-works. They suffered little difficulties perhaps in regard to the raising of capital, but they had the rates behind them, and they did not hesitate to call upon them for trading purposes. However, the way they conducted their gas business was satisfactory to those they represented; and he did not dare to offer criticism upon it. If there was a point upon which one might do so, it was that they charged in some cases a little more for their gas than was necessary in order to bolster up the rates. This might be very convenient from a financial point of view, but it was not equitable, because it resulted in this, that those who burned gas helped to pay the rates of those who did not. However, he merely threw this out as a hint to some of the municipalities. The toast he had to give was coupled with the name of the Chief Magistrate of the City of London—the chief citizen of the first city in the world. They appreciated very highly the compliment the Lord Mayor had paid the gas industry by coming to open the exhibition, and they were extremely grateful to him. He hoped the Lord Mayor had learnt something from what they had been able to show him. In after-dinner speeches, figures were very indigestible; and he should not for one moment dare to trouble those present with any if it were not in connection with the matter which had brought them together.

A LITTLE BIT OF HISTORY.

He thought, however, they might be interested to hear a few statistics with regard to the gas industry in the Metropolis, because that perhaps was the largest, and all others were more or less like it. *Ex uno disce omnes.* The growth of the industry had been comparatively rapid. Just over a hundred years ago there was no gas lighting. It was only in 1803 that Mr. Winsor, who was the founder and a Director of the Company of which he (Sir William) had the honour now to be Governor, lighted the Lyceum Theatre with gas, and there gave lectures on gas and gas lighting. Four years later, gas was used for the first time for public illumination; Pall Mall was lighted, as was also Whitehall, and Whitehall had enjoyed the privilege and blessing of gas lighting for all that time until the last few years, during which it had been illuminated by electricity. Before long, gas would resume its position in Whitehall (cheers), and before another winter passed, he hoped the familiar warm and genial light would shed its rays over their legislators as they went down to the House. The first Gas Company was established in 1809—that was the Chartered. The year following, King George III. was empowered by Parliament to grant the Company a Charter of Incorporation, with a capital limited to £200,000. The Company went along with this sum for a time. In 1813, they had got so far with their works that they were able to illuminate Westminster Bridge; and it had been lighted with gas ever since. In 1859, there were thirteen Companies supplying gas in the Metropolis; and cutting one another's throats as hard as they could. There were no end of mains laid in every street. The results of the competition became intolerable; and so Parliament decided that the thirteen Companies should each have a district assigned to them. Now, under the amalgamation clauses of the City of London Gas Act, there were only three Companies doing the whole of the gas lighting of London. He ought to have mentioned that in 1820, or thereabouts, and for some years afterwards, the price of gas was 15s. per 1000 cubic feet. But there were no meters; and the consumption was estimated. Therefore the Companies naturally took rather a full view of what a bill ought to be. (Laughter.) Then in 1868, the erection of the great gas-works at Beckton was started; and the small works belonging to the Gaslight and Coke Company were turned out of London. The Beckton works covered something like 500 acres of land, with fourteen retort-houses, some 500 feet long by 100 feet broad. There were also nine gasholders there—in short, at Beckton they had the biggest gas-works in the world. His modesty prevented him saying anything more about them.

A STRIKING COMPARISON.

If he was not transgressing, he should like to make a comparison with thirty years ago. In 1870, the capital of the three Metropolitan Gas Companies was £8,259,277; at the present day, after the Conversion Acts, the capital stood at about £38,000,000. The coal carbonized in 1870 was 1,225,839 tons; and last year, 3,076,773 tons. These were big figures; and perhaps they would not appeal to everybody. But what they meant was this, that the last figure was equal to a consumption of 6 tons of coal per minute, or 9000 tons per day, throughout the year. This would bring home to everybody the enormous quantity of coal that was carbonized for the purpose of lighting London. Well then there was no oil or spirit used in 1870; now the Companies consumed 16,003,990 gallons every year. The quantity of gas sold in 1870 was 10,350,379,000 cubic feet; and last year it was 34,928,686,000 cubic feet. This showed the remarkable growth of the industry in the last thirty years.

THE PREPAYMENT SYSTEM.

There was one other matter which was rather novel and modern—that was, the slot-meter system. In 1894, the total number of consumers on this system in the three Metropolitan Companies' districts was 26,937. By June, 1904—ten years later—the number had risen to 368,790, and it was constantly increasing. The gas sold under this system by the Gaslight and Coke Company in the year ending June

A View in the Queen's Palace on Saturday—General Exhibits Section.

last was 2,309,830,000 cubic feet, of a value of £430,079. The number of pennies collected was 103,218,960, and the weight was 888 tons. This would give some idea as to how the slot business had progressed; and the same remark applied to stoves, gas-engines, and other appliances for utilizing gas. In his concluding remarks, Sir William said he did think the gas manufacturers of the United Kingdom were entitled to a little credit for what they had done. Now, to crown everything, they were giving London one of the most magnificent exhibitions they could possibly have. With all his heart, he commended the toast of the "Municipal Corporations of the Empire," and coupled with it the name of the Right Hon. the Lord Mayor, who had so kindly attended to open the exhibition.

The Lord Mayor's Reply.

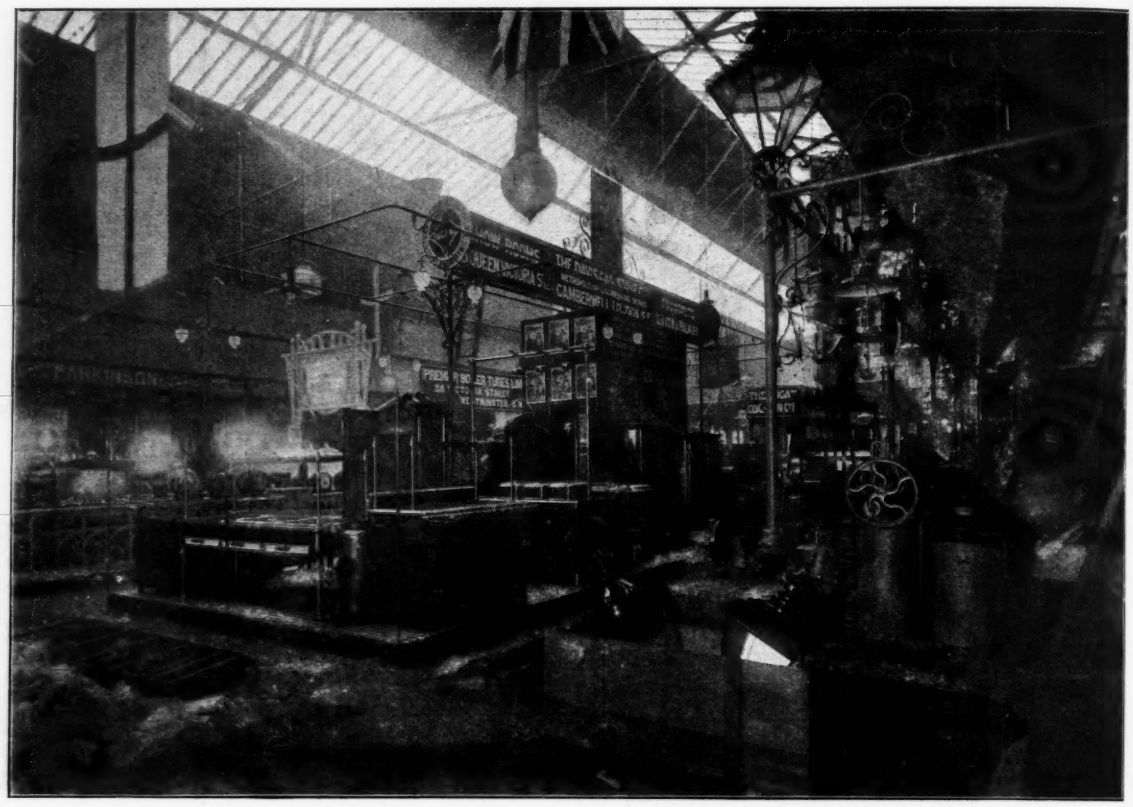
The Lord Mayor said they had allotted to him a most compendious toast, to which, if there were time, he and his brother mayors might apply an elaborate and interesting criticism. He considered it a very high compliment to have been invited to open, and to have had the honour of opening, this exhibition. From a statement which had been given to him, he felt that all London would be immensely gratified and interested by a visit to Earl's Court. He had been reminded that 22 years ago his predecessor, Sir Henry Knight, opened the previous exhibition at the Crystal Palace; and those who were present then and were present on this occasion were simply amazed at the great improvement which had been introduced since 1882. It might be that much of the impetus which had brought about this improvement had been due to the searching competition of the electric light. But he had no fear that electricity would supplant the use of gas; seeing that, in the majority of instances, the latter was more economical and efficient. The municipal interests were, he believed, animated by a desire to promote the welfare and increase the health and comfort of the inhabitants for whom they worked. Speaking for the Metropolis only, he regarded the course of the Borough Councils as tending in the greatest degree to a better state of things in all those vital matters with which a municipality might properly deal. He would not attempt to discuss the thorny subject of municipal trading, except to say that he should regret to see any large use made of the rates to foster competition with industrial concerns which might ultimately devolve upon the ratepaying community. He concluded by thanking those present for the toast, and by wishing great success to the exhibition.

The Gas Industry.

Mr. Sheriff Strong said he had been entrusted with what must be admitted to be if not the toast of the evening, yet one of the greatest importance, because it was to "The Continued Success of the Gas Industry," and with it he united the name of Mr. D. Irving, the President of the Institution of Gas Engineers. He took it that gas was mostly sold even yet for illuminating purposes; and there they came into conflict with other systems of lighting. But he ventured to say the electric light was the luxury of the rich; while gas lighting became the necessity of the poor. And it was because those of them who were not financially interested in gas, yet desired the greatest good for the largest number, were there that night to wish continued success to the gas industry. He need scarcely refer to the branch of cooking and heating by gas; but with regard to power gas, he knew that the gas industry there entered upon a field which practically had no limits. He met an engine constructor a few months ago—a man who was well known in this country—and he said to him (Sheriff Strong): "I have come to the conclusion, on the grounds of my own self-preservation as an engine manufacturer, that I am bound to give more attention in the future to gas-engines than to the steam-engine." This was because, in the judgment of this expert engineer, the indications of the present day pointed to the future use of gas for motive power. This was a fine field which gas engineers had to thoroughly acquire, although they had made a most promising beginning. He felt that those identified with gas were engaged in an industry which, while giving them a legitimate profit for the employment of their brains and labour, yet conferred a great advantage on the British public.

The President of the Institution Responds.

Mr. D. Irving said that the duty of replying to this important toast devolved upon him through the accidental circumstance that he happened to be the President of the Institution of Gas Engineers, and not because of any special qualification that he possessed. However, he was very proud of the honour. He had never before been associated with so much gold chain and ornamentation as he had the pleasure of being that night. There seemed to be as much gold chain about him as would make a coke-conveyor. (Laughter.) Having regard to the excellent address of Sir William Makins, it was quite unnecessary for him to give any figures; and therefore he should drop out almost all reference to the gas industry, so far as figures were concerned. He was pleased to say that the industry (they had the evidence all round them) was growing by leaps and bounds—the price of gas to the consumer was being steadily reduced, the profits were being maintained, and business was growing apace. What more could they desire? Nothing could be more satisfactory. He believed that the gas industry grew simply because it was based upon right principles. The first duty of a gas undertaking—and this he thought had been thoroughly recognized—was to consider the interests of the consumer; and so long as gas undertakings kept this before their eyes, success was assured. Another thing which had tended more than anything to the great success of the gas industry had been the competition of electricity. Now taking the Bristol Gas Company with which he had the honour to be connected. There was established in that city some twelve years ago a municipal electric light undertaking, which was well and ably conducted. Yet, notwithstanding the progress of the electric light undertaking, the business of the Bristol Gas Company had grown year by year; and the period of greatest prosperity had been the period of the greatest competition. This was not only so with regard to Bristol, but on every side. Some reference had been made comparing the exhibition that they had had the pleasure of witnessing with the one held some quarter-of-a-century ago; and the comparison was greatly to the credit of the present display. Its success was due very much to the splendid co-operation of the manufacturers connected with the industry; and in speaking of success, he should like to couple with it the name of the Chairman of the Advisory Committee, Mr. Helps. If there was one person more than another to whom was due the success of this display of the progress of the gas



Second View in the Queen's Palace—General Exhibits Section.

industry, it was Mr. Helps, for he had put into it his indefatigable energy and organizing ability. He thanked all present for their exceedingly warm expressions of good-will towards the gas industry. Personally, he believed it had before it a future far exceeding anything ever experienced in the past.

Success to the Exhibition.

The Lord Mayor of York (Alderman R. H. Vernon Wragge) proposing "The International Gas Exhibition," expressed his pleasure in being present to support the Lord Mayor of London. He regarded the exhibition as perhaps the most appropriate one that could be held at the present time. They knew perfectly well what had happened in the past few years since the electric light was installed in this country; and he did not think there was a gentleman round those tables that night who regretted that the electric light had been installed in the country. Certainly the British public had no reason to regret it, because there was nothing like a little bit of healthy rivalry. A little keen competition, whether in gas or anything else, was bound to bring the best efforts forward. Electricity had been a great stimulus to the gas fraternity throughout the country; and hence they saw in this exhibition the result of their fruitful labours. In his own city, the Gas Company did their work well, and they supplied gas, of a valuable character, at something like 2s. per 1000 cubic feet. Now he could not himself see how it was possible at the present moment to compete with the new inventions in gas lighting with gas at anything like a price approaching that. He believed there was a very bright future for the gas industry, as anyone would see who looked round the exhibition. The different municipal councils throughout the country should certainly come and see the exhibition and learn exactly what gas lighting could do in the early part of the Twentieth Century. If electricity was better and cheaper, by all means let the people have it; but if gas could compete favourably with electricity, there was no reason why it should not have a fair share of business in the supply of the community. The exhibition was bound to have a successful career; and, at its termination, the status of gas would certainly be firmer than even it was at the present moment. He gave the toast, coupled with the names of Mr. Helps and Mr. C. Clare.

Mr. Helps, in reply, said how very heartily he appreciated the great honour of being associated with the toast. It had been said, and he thought very truly, that the success of any undertaking depended to no small extent upon its having a good send-off; and if this be true, then the success of this gas exhibition was already assured. It had been remarked that those present who were interested in the gas industry appreciated very highly the presence of the Lord Mayor, who had given up so much of his valuable time at the outset of his taking up his municipal duties to come there to further the interests of the industry to which they were all very much devoted. It was an industry that was undoubtedly a most important one. He thought that an industry in which some 120 millions of money was invested in capital, and which yearly consumed some 14 or 15 million tons of coal must be classed as one of supreme importance. His friend Major-General Moody had told them that some 65,000 stokers were employed by the various gas companies in the kingdom. He (Mr. Helps) could hardly follow him in that estimate; but if the General was prepared, instead of saying stokers, to simply include men of all classes in the industry, then he believed he might be perhaps nearer the mark. He thought he had said sufficient with regard to the industry to show that it did justify the Lord Mayor of London and the Sheriffs, and the Mayors of various towns and Metropolitan Boroughs coming that night to show how much they appreciated the efforts of those engaged in this industry to do all they possibly could to provide what had been described as a necessity of the poor. With regard to the exhibition itself, he must, in the first place, offer an apology to their visitors on account of the exhibition not being in quite so forward a state as they could have wished. But he was assured by those who were in a position to judge that they had never before visited an exhibition of such importance as this one that had been in such a forward condition. However, in spite of assiduous and very strenuous efforts of all concerned, it was not quite complete. Those who had been round the exhibition must acknowledge that the getting together of so many exhibits and so much apparatus, and so many useful articles—exhibits which covered every branch of the industry from the time that the coal left the pit to the time that it was consumed in the burners—must entail a large amount of effort, thought, industry, and enthusiasm. But even the exercise of those qualities would have failed to bring about the result they had before them, had it not been for the perfect unanimity which prevailed among all the contracting parties to the success. He must remind those present that the contracting parties were three in number. First of all, there was the Institution of Gas Engineers as represented by the Advisory Committee; then the organizing Managers (Messrs. Bridges and Smith); and then, finally, but certainly not the least, the exhibitors and those manufacturing firms represented by exhibitors. These contracting parties, forming a trinity which had been a unity, had worked thoroughly with one object in view—the determination to bring to a successful end an exhibition which they set out to make a success. Whether that success had been gained he left for those present and other visitors to settle. He believed it was a success, and would prove to be still further so. He wished to acknowledge, and took this opportunity of acknowledging, the great assistance the Advisory Committee had received from the exhibitors in connection with this exhibition. Without the exhibitors, they could not have held the exhibition. They formed themselves into an Exhibitors' Committee. They had been ever-ready to give the Advisory Committee advice; and had been ready to take the advice that the latter gave them. He wished also to acknowledge the extremely loyal support he had received from every member of the Advisory Committee. They had all striven with but one aim in view—simply to prove that a gas exhibition of this sort could not only be made a success, but could be made of lasting benefit. He also wished to personally thank their Secretary (Mr. Webber) for what he had done. There was, too, one other matter he should like to refer to, and that was the great financial support that they, as the Advisory Committee of the Institution of Gas Engineers, had received from gas companies throughout the United Kingdom. It was at first thought, when the exhibition started, that, as it was to be held in London, it was not likely to benefit gas companies at a distance in England, Scotland, and Wales. But through the information supplied in one way or another—showing that it was the intention that the exhibition should be something more than a local effort, that it

was intended to show to the general public that gas was not dead yet, that it had any amount of vitality, and that it had a sphere of usefulness which could not die nor drop—they had had a most ample response from gas companies, even so far away as the north of Scotland, the north of Ireland, and the west of England, who had supplied the funds which would do something towards making the exhibition a success outside the commercial aspect. During its course, they would be able to show that this exhibition would be an interesting and instructive one—not only to those who were scientifically inclined and who came to learn something from the machinery exhibited, but also the general public, who came to see the methods whereby they could make their homes better, brighter, and cleaner; and, finally, he thought they would be able to do something towards showing London a way of dealing with the fog fiend. He thanked those present for associating his name with the toast. Whatever work he had done in connection with the exhibition had been purely a labour of love; and its success was all the reward he asked. (Applause.)

Mr. C. Clare (Messrs. Fletcher, Russell, and Co., Limited) said he wished to explain, from the exhibitors' point of view, why he thought this exhibition would prove such a success. The exhibitions of late years had not been organized from a central source; but had been formed at the instigation of irresponsible persons, who had made it their business to get up exhibitions of various kinds. It was a costly matter to manufacturing firms to exhibit in this way; and therefore they thought that, unless there was some authority for these exhibitions, it would not be considered disloyal if they did not support them. The advantage which he thought this exhibition had was that it was organized under the direct supervision and control, and in fact owed its inception to, the Institution of Gas Engineers. He thought this was one of the reasons why the exhibitors were there. There was another great reason why they were spending their money so freely as they had done, and that was they wanted to show that the exhibitors of 1904 could at any rate do as well as those they had heard about who exhibited in 1882. At that time, the power of electric lighting was disturbing the minds of gas people generally, and probably that marked an epoch in the life of the gas industry; and they would like this

View in the Queen's Palace Annexe.

exhibition to also prove a landmark in its history—from an educational point of view to show how much had been done in the last twenty years, and also foreshadowing what was to come in the next few years, because he believed, in one branch at any rate—that was the use of gas for trade purposes—they had only touched the fringe of the business. It was hoped that the elaborate machinery, the varied assortment of cooking and heating apparatus, the beautiful systems of lighting, and the stands devoted to specialities, had convinced gas engineers that the exhibitors had tried to do their part towards making the exhibition a success. As exhibitors, they owed a great deal to Mr. Helps and the Advisory Committee. The man who worked the thing was Mr. Helps; and they had to thank him and the Committee for the courteous manner in which any practicable suggestions emanating from the Exhibitors' Committee were considered and acted upon. As Chairman of the Exhibitors' Committee, he should also like to thank Messrs. Bridges and Smith for the efforts they had made on behalf of the exhibitors, and for the attention they had paid to the wishes of the latter. Their energy was certainly wonderful.

Mr. D. Milne Watson, in an effective speech, proposed "The Visitors," to which Cav. F. F. Righetti responded. To save time, Mr. John Glover combined the toasts of "The President" and "Messrs. Bridges and Smith." Mr. Jones, in acknowledging the compliment, said he had been delighted to hear from Mr. Clare that it was the stamp of authority which the Institution of Gas Engineers gave to the exhibition that had induced the exhibitors to come forward, and had given them confidence in spending their money. There was another thing he should like to refer to. He (the President) was very fond of his work in gas; and he was proud of his position as a gas engineer. One gentleman spoke of his friend the gas-engine maker who had been converted from a steam-engine maker. His (Mr. Jones's) own confidence was shown when he said that he believed they were upon the mere fringe of what was before them. They would be purveyors of fuel and heat to the world. They converted their coal into various useful forms; and above all they converted it into fuel and power which could be most easily distributed over great distances. This was where they would find a great future. He knew that many in that room had wondered why he gave his support to the great departure of the Mond gas. When he refused to shut himself up in any corner or quarter and say, "This is the only gas I will be engineer to," he believed that coal gas was the best of all the gases, and that they had only to liberate themselves from the trammels that had been put upon them by ignorant opposition, and they would then produce coal gas on terms which would place it above any competition with any system whatever. He was also pleased to be able to acknowledge that, directly the exhibition was put on foot, Mr. Helps and Mr. Shoubridge, with Mr. Goulden and Mr. Carpenter, put their hearts thoroughly into the matter. It was also evident to anyone who walked round the exhibition that the exhibitors had themselves come forward right well and excellently. He was also pleased indeed to have heard all round nothing but praise of Messrs. Bridges and Smith. Mr. Smith also replied on behalf of his firm.

The evening was an altogether gratifying one; and there was no other opinion abroad than that a start had been made with the exhibition that presaged success, during the four weeks, of a very brilliant order.

GENERAL LIGHTING OF THE EXHIBITION.

The general lighting of the exhibition and grounds has been allotted to the following firms; and the positions in which their demonstrations are to be found is noted for the convenience of visitors:—

Bray Lights (Messrs. George Bray and Co.)—Queen's Palace and Annexe.

Falk, Stadelmann, and Co.'s Lights (Messrs. Falk, Stadelmann, and Co., Limited)—Part of Queen's Palace and Grounds.

Keith Light (James Keith and Blackman Company, Limited)—Part of Queen's Palace.

Lucas Lights (Moffats, Limited)—Part of Queen's Palace.

Millennium Light (The British Compressed Gas Company)—Machinery Hall.

Pharos Light (The Pharos Lighting Syndicate)—Entrance Hall and Grounds.

Sale-Onslow Light (Messrs. T. Glover and Co.)—Part of Ducal Hall.

Selas Light (Messrs. Bever and Wolf)—Part of Queen's Palace and Grounds.

Sugg Light (Messrs. William Sugg and Co., Limited)—Part of the Ducal Hall and Grounds.

[For particulars of each firm's lighting, see the references under their names in the description of the stands—pp. 554-603.]

EXHIBITION ENGAGEMENTS.

Nov. 24.—Visit of the Southern Association.

Nov. 26.—Visit of the Midland Association.
Also Special Meeting of the Institution of Gas Engineers, *re* Affiliation.

Nov. 28.—Visit of the North British Association.

Nov. 29, 30, and Dec. 1.—Visit of the Irish Association (First Party).

Nov. 30.—Visit of the North of England Association.

Dec. 1 and 2.—Visit of the Eastern Counties Association.

Dec. 3.—Visit of the London and Southern Junior District Association.

Dec. 6.—Visit of Continental Gas Engineers, Reception, Etc.

Dec. 9.—Visit of the Manchester Institution.
Also Manchester and Yorkshire Junior Associations.

Dec. 11, 12, and 13.—Visit of the Irish Association (Second Party).

Dec. 12.—Special Meeting of the Institution of Gas Engineers (Affiliation).

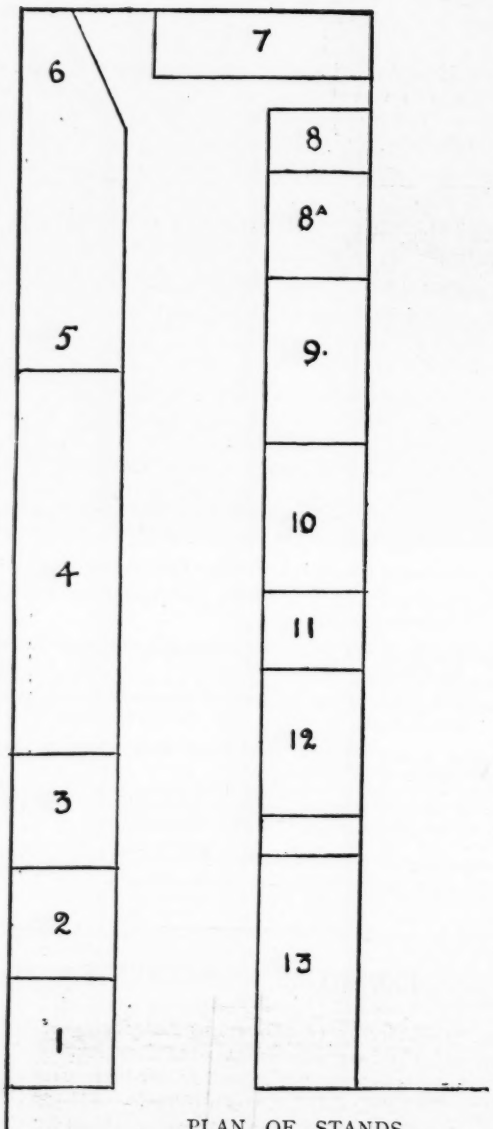
Cookery Lectures and Demonstrations Twice Daily.

Ten Minutes' Scientific Lectures Twice Daily.

NOTICES OF EXHIBITS.

IN PRINCES' HALL

(Heavy Machinery Section).



PLAN OF STANDS.

Messrs. Bilbie, Hobson, and Co.

(Stand No. 1.)

This stand is lighted by an installation of high-pressure gas-lighting on Sale and Onslow's patent system. The firm are showing three sizes of "Stockport" gas-engines, as London Agents of Messrs. J. E. H. Andrew and Co., Limited—viz., 40, 25, and 11 brake horse power. All these engines (see next page) have the exhaust-valve and charge-valve fitted inside the cylinder end or combustion chamber—thus doing away with all passages. A special feature of the disposal of the valves of these engines is that the exhaust-valve is placed in the bottom, and the charge-valve in the top of the cylinder end, and directly over the exhaust-valve. When the charge-valve is removed, the exhaust-valve can be taken out through the same opening. This does away with the necessity of a separate cover over the exhaust-valve; and the position of the charge-valve relative to the exhaust-valve gives a better flush of air to the cylinder at the end of the exhausting stroke than if the charge-valve is placed at right angles to the exhaust-valve. The 25 brake horse power engine is also fitted with electrical ignition, with a trip-gear that can be varied so that the time of ignition can be altered when the engine is working. This engine is also fitted with ring oiling crank-shaft bearings. All the crank-shafts in these engines are cut out of the solid, and finished bright all over. The firm still retain their design of casting the cylinder with the frame so as to reduce the overhang. The cylinder end, or combustion chamber, is a separate piece. All the engines are fitted with separate air quietening chambers, which form no part of the frame of the engine.

Chemical Engineering and Wilton's Patent Furnace Company.

(Stand No. 2.)

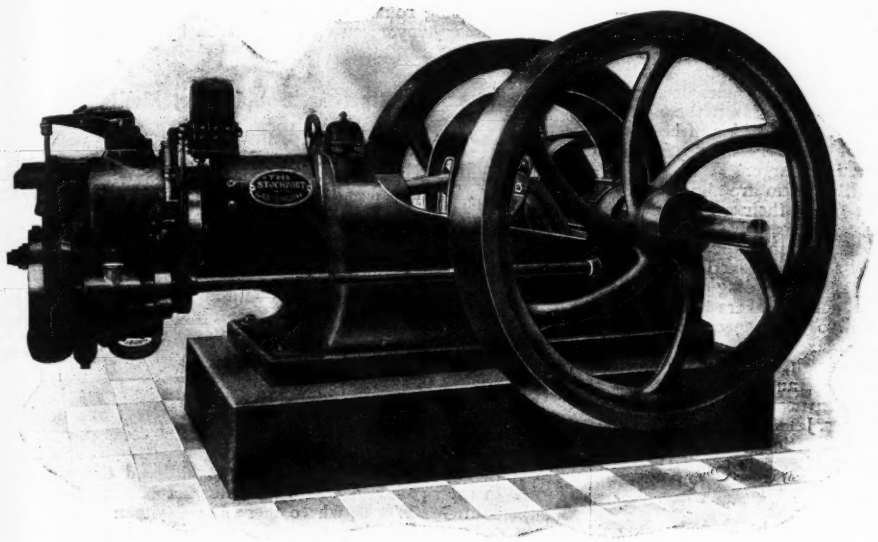
The well-known productions of this Company are illustrated by apparatus for the manufacture of sulphate of ammonia and also by the Wilton patent furnaces. Needless to say that the workmanship and general build of the plant shown is up to the standard of their reputed excellence. Regarding the sulphate plant, three saturators are being exhibited—two of the round open pattern for the production of 10 cwt. and 20 cwt. per day respectively, and one of the round closed saturators, with discharger, for the production of 3 tons. The great feature of the latter (open) saturator is its round construction; there being no angles or curtain to tear away, and bulging and distortion (as is sometimes experienced with the rectangular forms) are entirely prevented. Although this saturator has only been on the market for twelve months, we understand the Company have executed, and have in hand, orders for fourteen of this pattern. The closed saturator is an article intended for large works, and is fitted with the Company's patent discharger. One of these saturators, it is noted, has been in constant use for the past eleven years, turning out 20 tons per day. It is interesting to learn that the thickness of the lead is only $\frac{11}{16}$ inch; and the repairs during the whole period have been so small as to be hardly worth mentioning. It is still in use, and can be inspected by appointment. Sections are exhibited of the Company's patent ammoniacal liquor still, which is so constructed that all the working parts are either accessible or removable for cleaning, thus overcoming the necessity and expense of periodically pulling down and rebuilding when clearing the lime deposit. It may be remarked that, with a 2 ft. 6 in. diameter still, the manufacture of 2 tons of sulphate in twenty-four hours is easily accomplished, and with a 5 feet diameter still 15 tons—the effluent liquor testing from 0·01 per cent. to 0·02 per cent. ammonia. A patent spent liquor valve is also shown. It is operated on the float principle, and automatically allows the spent liquor to flow away without loss of steam. It also prevents the flooding of the still, or its blowing empty. One of the most recent patents—viz., an automatic lime pump—is also seen. This entirely does away with the necessity for liming chambers. The pump is operated on the float principle, and can be adjusted to fill and automatically discharge at any required constant rate. As to the patent furnaces, these, we are informed, have now been adopted by over 100 gas-works. The pattern of the furnace has recently been improved to great advantage. A patent oil-burner is also noticed. The chief novelty of this is the application of an injector for inducing air for atomizing the tar, thus requiring much less steam than with most methods—considerably increasing the efficiency, and almost entirely reducing the vibration. When burning oil in conjunction with the Company's patent furnace, it is easy to maintain a large bed of breeze under slow combustion below the oil-burner, and so assist the combustion, ensure easy ignition when the burner is started, and entirely prevent the possibility of any explosion when the flow of oil or tar is interrupted by water or other causes. It will be seen that there is much on this stand to be inquired into by the gas engineer.

The National Gas-Engine Company, Limited.

(Stand, No. 3.)

The "National" gas-engines are widely known; and here are examples of types suitable for town's gas. One of the "O" type engines, which will give 14-brake horse power as an absolute maximum load when working on town gas, is fitted with two fly-wheels, and is the type of engine that is supplied for driving general machinery, &c. One of the "K.A." type engines, which is of exactly similar design to the above engine, but will only give 4½ brake horse power on town gas, is also exhibited, as well as one of the Company's latest designed high-speed engines

(horizontal type), with enclosed crank, and coupled direct to the armature spindle of a dynamo. This engine will run up to 650 revolutions a minute, and at this speed will have an output



THE 25-BRAKE HORSE POWER "STOCKPORT" GAS-ENGINE WITH ELECTRIC IGNITION.

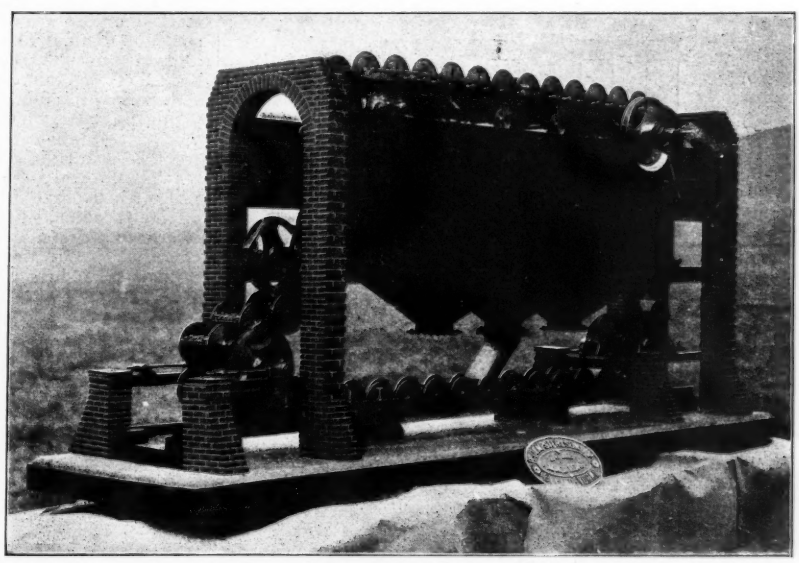
of eighteen 16-candle power lamps. Separate gas and electric meters for this little engine and dynamo are arranged for, so that direct readings may be taken at any time to show the consumption of gas in relation to the output of electrical energy. We believe that this little high-speed engine is the first of this type that has ever been designed; and the Company's object in bringing it out was to meet the demand that is now being made for a small compact set of engine and dynamo combined, either for direct lighting or for charging batteries in private house electric installations or business premises.

Messrs. Robert Dempster and Sons, Limited.

(Stand No. 4.)

There is novelty to be found at the stand of Messrs. Robert Dempster and Sons, Limited, of Elland; and the working operation of several representative sections of plant are to be examined here. The firm, like other contractors, have found that it is well to have two strings to their bow. If makers of stoking machinery for horizontal retorts, then the proper thing nowadays is to have an inclined retort department attached to the business; if inclined retort builders, then it is equally important to be abreast of requirements by having special charging and discharging machines. For this reason, it is found that, at their stand, this firm are exhibiting for the first time a charging machine of their own and also pushing or drawing out machines. As to the charging-machine, there is something robust about the statement made that, "unlike other chargers, this machine performs its duty like a man; and while working at only 80 revolutions per minute, it hurls 640 shovelsfull of coal into the retort at a maximum speed of 22 miles per hour—thus completely charging a 20-foot retort with 9 cwt. of coal in 20 seconds." It is proposed to show the machine in operation, and it is claimed it will push out the coke from the retorts, draw out, or push part out and draw out the rest. The machine does not put any weight on the retort.

The other novelties on the stand are: Dempster's patent hot-coke conveyor, for removing coke as it leaves the retorts, and stacking same in hoppers or the yard. A conveyor of the endless tray type, suitable for the handling of coal, coke, ashes, or other similar material. A portion of an elevator showing buckets, chains, and skidders, suitable for elevating coal, &c. A coal-breaker. A portion of a retort-setting showing Waddell's patent regenerators; also firing and clinkering doors and frames, sight-boxes, &c. A corrugated flue regenerator. Retort mouthpieces, with self-sealing lids; and the cross bars and screws needed for luted mouthpieces. A combined gas-engine and a rotary exhauster. A horizontal steam-pump. There is a working-model of Dempster's patent gravity "Tipit" bucket conveyor, described in the "JOURNAL" for Nov. 1. A working model of a telescopic hydraulic hoist, suitable for raising clinker from retort-house subways, and for use in purifier-houses, &c. A model of a clean-water distributor for tower scrubbers. A model of a liquor turbine distributor for tower scrubbers. A model of Dempster's improved dry-faced centre-valve, which will work all or any number of a set of four purifiers. A model of Dempster's dry-faced valve for working three on and one off. One of Dempster's patent connectionless centre-valves; this valve being fixed in the centre of the purifiers, and doing away with all connections. A selection of wood grids for purifiers. Internal and external rack valves, and internal and external screw valves, disc valves, hydraulic main valves, &c., &c.



DEMPSTER'S "TIPIT" BUCKET CONVEYOR.

Messrs. W. J. Jenkins & Co. Limited.

(Stand No. 5.)

It goes without saying that Messrs. W. J. Jenkins and Co., Limited, of Retford, are in a position to interest all with their numerous specialities. We need only name what is to be seen to demonstrate this. A working model of the "D B" patent coal projector for charging gas-retorts is first noted; and then one of the machines is seen in motion. A section of the "De Brouwer" patent trough for dealing with hot coke is shown, in which attention is drawn to Jenkins's patent renewable bottom plate. Three designs are exhibited of the "De Brouwer" patent chain used in connection with the hot-coke conveyor; and a working model is illustrating the various points of the conveyor. Among the other exhibits are to be noted one of Jenkins's improved cannel breakers for dealing with large coal and cannel; and one of the same inventor's adjustable coke-breakers to suit any size coke. A Ω-shaped mouthpiece, 22 in. by 16 in., is fitted up complete with eccentric fittings. Several photographs and prints, showing the "D B" patent coal-projectors, the "D B" patent pusher discharging machine, the "De Brouwer" patent hot-coke conveyor, cannel-breakers, coke-breakers, air-fans for the ventilation of mines, tunnels, &c., and for increasing the delivery power of trunk mains for coal gas supply; also gas and motor fans, inclined-retort installations, coke-storage hoppers, coal conveying and elevating plants, air compressors, &c.—all go to make up an attractive display.

The most interesting novelty to gas engineers at the stand is no doubt the much-talked-of "D B" projector, which is to be seen in action. Messrs. Jenkins and Co. have erected one of these machines upon overhead rails, showing the suspended type of projector in the act of charging a 20-feet through retort, through

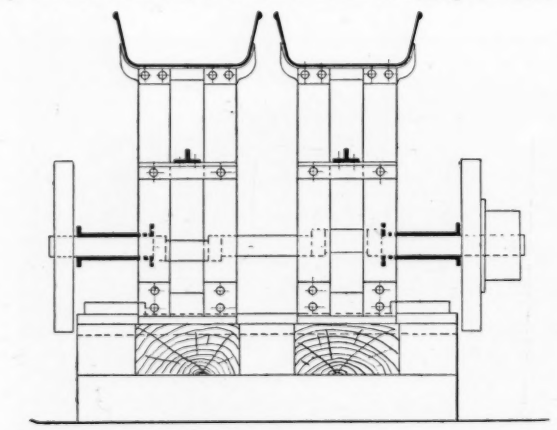
a 22 in. by 16 in. Ω mouthpiece. This projector has undergone very slight alterations since the first machine was started to work in England at the Cavendish Street works of the Derby Gas-light and Coke Company; and we gather that Messrs. Jenkins have now at work or in hand 21 installations for them in different parts of the country, in addition to having orders for eight "D B" patent pusher discharging machines to work alongside the projectors. As the projector referred to above does not project coal into the retorts, Messrs. Jenkins have a working model in which they charge retorts, from 10 feet singles or 20 feet throughs; and those engineers who have not seen the actual machine at work in gas-works can form a good idea of how the projector can put in even layers of coal in the various sections of retorts which the machine is called upon to charge.

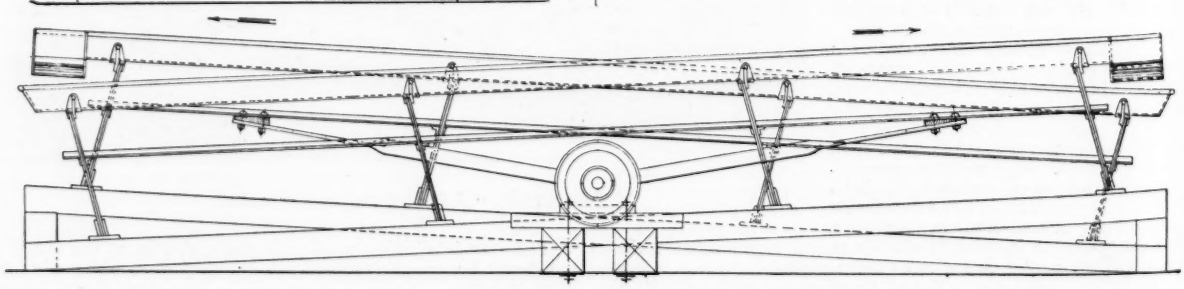
Among other exhibits, as mentioned, the firm are showing one of their large cannel breakers, for use with their projector and inclined-retort installations; it being of massive type. The makers have so painted this cannel breaker that the parts constructed of steel and cast iron can be easily picked out. The weight of the breaker just reaches 5 tons. Standing close to the machine, is one of the firm's improved coke-breakers to illustrate how the steel claws can be adjusted, so that the coke may be broken to any desired size. The full-sized section of the De Brouwer patent hot-coke conveyor trough, in which is shown Jenkins's patent renewable bottom plate, and the De Brouwer chain fitted up complete, and as used in nearly all installations of hot-coke conveyors erected by Messrs. Jenkins and Co., will be examined with interest. Since the introduction of this conveyor into England, and first put into use at the Crystal Palace District Gas Company's works at Lower Sydenham in the latter part of 1899, some 30 installations have been made in this country. The fact is noted as interesting that there are more than three miles of this conveyor chain now working. A model of the conveyor is also to be seen in operation, embodying all the latest improvements. On the stand are arranged some of the fans manufactured by the firm, including both blast and gas cleaning fans, which can be arranged to be driven by belt or electric power; but, owing to space, Messrs. Jenkins have had to rely upon photographs to a large extent to show the various sizes and types of fans which they manufacture. Another working model in which many engineers will be interested is the "Gender's patent" method of working the travel of railway point switches. Knowing the many miles of rails in use in all our large gas-works, and sometimes (especially with railway companies) the loss of life, we feel sure the model will prove of interest. Another model of great interest to the gas profession is that of Messrs. Browne and Chandler's patent "vaporizing" condensers, which is shown for the first time, but as interesting pamphlets on this subject are being given away at the stand, engineers will be able to form for themselves a good idea of the merits of this new condenser, which was fully described and illustrated in the "JOURNAL" for Aug. 23 last, pp. 522, 530.

Mr. G. F. Zimmer.

(Stand No. 7.)

Across the top of the Princes Hall is the stand occupied by Mr. G. F. Zimmer, at which he is demonstrating the working and utility of his form of swinging conveyor. The principle of its construction is well known, having been several times noticed in the "JOURNAL." Here there are two short lengths of conveyor, showing all Mr. Zimmer's latest improvements. One conveyor delivers on to the other, so that the coal being conveyed is perpetually going round and round—thus illustrating clearly the action. The conveyors on view are driven by a small Stockport gas-engine.





THE ZIMMER CONVEYOR.

Messrs. William Grice and Sons, Limited.

(Stand No. 8.)

Messrs. William Grice and Sons, Limited, of Birmingham, are showing in motion one of their "G" type of engines, giving 19 brake horse power at 210 revolutions. It represents their usual commercial engine of the latest type, having features of simplicity and strength well worth the consideration of companies and corporations who desire a reliable engine to recommend to their clients. It will be noticed that the back or valve-box end of the engine is a separate part. This contains the usual valves. To expose them, and to take them out for cleaning, only requires removal of the glands. This only represents a few minutes' work, which is a great consideration. All gears are cut; and the engines generally are well finished. Timing valves are fitted; and all the engines are now supplied with two fly-wheels. The sizes of engines manufactured, we are informed, are in single engines from 2 brake horse power to 150 brake horse power; and the double-cylinder engines for larger power up to 250 brake horse power. Many corporations have adopted these engines for use in their gas-works. As examples may be mentioned the Birmingham Gas-Works, where there are fourteen engines, and the new Granton works at Edinburgh, where there are seven engines—three of 125 brake horse power each. This speaks favourably for the reliable nature of the manufactures of the firm.

The British Westinghouse Company.

(Stand No. 8A.)

The British Westinghouse Company have an office at the exhibition, with engineers in charge. The Company are not showing their gas-engines, as was anticipated; the engines now passing through the shops being all required to fulfil the various orders in hand.

However, we may include a few notes as to these engines, prefacing what follows with the statement that the single-acting gas-engines are made in sizes from $7\frac{1}{2}$ brake horse power upwards. From $7\frac{1}{2}$ brake horse power to 275 brake horse power, they are vertical in form, with either two or three cylinders. The two-cylinder style includes sizes from $7\frac{1}{2}$ to 55 brake horse power; while the sizes of the three-cylinder style range from 37 to 275 brake horse power. Above 275 brake horse power the engines are double-acting, and have either vertical or horizontal cylinders. In the two-cylinder engines, the cranks are parallel with one another, and are counterbalanced to ensure smooth running; while in the three-cylinder form the cranks are 120° apart. The vertical arrangement of the Westinghouse gas-engine, and the use of two or three cylinders, render the whole practically self-balancing, so that vibration trouble is eliminated, and light foundations suffice. These advantages are, of course, most marked in the three-cylinder form. The main bearings are supported in castings which form the ends of the crank-case. The centre bearings of the three-cylinder engines are supported on the bottom of the crank case. Each crank-shaft bearing is provided with a wedge adjustment for ensuring perfect alignment and taking up wear. Regarding the method of adjustment, a distance-gauge is inserted between a fixed block on the top of the crank-case and the shaft, while the height of the latter is being regulated. As the wear on the main bearing is always downwards, this method of adjustment enables the shaft to be kept in its original position. Furthermore, this adjustment allows of the clearance between the pistons and the cylinder heads being kept constant, so that the degree of compression of the charge is unchanged, and the performance of the engine unimpaired.

The cylinders are mounted on the enclosed crank case, which forms the base and frame of the engine. The gas burns in the enclosed space between the piston and cylinder head; and it must first be mixed with such an amount of air as will furnish sufficient oxygen for its rapid and complete combustion. If the

air supply be too little, the gas is not all consumed, and the economy of the engine is thereby seriously impaired. If, on the other hand, the air supply be too great, the quantity of gas used per stroke is reduced, with the result that the power of the engine will be lowered. In the Westinghouse engine, the right proportion of gas and air, it is claimed, is maintained under all conditions. The gas and air first enter a combined mixing and regulating valve chamber by separate inlets, and in proportionate amounts which may be adjusted by the attendant in case of any variation in the quality of the gas, but which otherwise remain constant. The regulating valve-chamber communicates with a passage in which are ports leading to the inlet-valves of the separate cylinders.

The cycle of operation is as follows: The piston being at the top of its stroke, and moving downwards, draws in a cylinder-full of the gas and air mixture through the inlet-valve; the exhaust-valve being closed. The charge is then compressed on the return or upward stroke. At the beginning of the second downward stroke, the mixture is fired by an electric spark. This firing is most accurately timed; and the resulting rapid combustion, which may be rightly termed an explosion, drives down the piston on its working stroke—the next upward stroke expelling the products of combustion through the exhaust-valve. As the valves and igniters have obviously to perform their functions once every two revolutions of the crank, the cams operating them must be mounted on shafts running only half as fast as the main-shaft. This reduction of speed is obtained by means of toothed gearing, a pinion on the crank-shaft engaging with a toothed wheel on the cam-shaft. It should be mentioned that the Westinghouse engine is started by means of compressed air; the multiple cylinder design rendering this a matter of ease.

Messrs. Crossley Brothers, Limited.

(Stand No. 9.)

It will not be the fault of the gas-engine makers at this exhibition if gas engineers do not return home from their inspection convinced that there is business to be done, where electric lighting is preferred, in the way of selling gas for generating current. The exhibit of Messrs. Crossley Bros., Limited, is an example. Here is found their "SE" type high-speed electric light engine, capable of developing 27½ brake horse power as a regular working load, coupled direct to a dynamo for lighting their stand with both arc and incandescent lights. The firm have also lent the exhibition authorities one of their ordinary "O" type gas-engines, which develops 13 brake horse power as a regular working load; and this is fixed to drive shafting. In addition to these examples, one of their "LE" type of high-speed electric lighting engines, giving 5½ brake horse power as a regular working load, has been lent for lecture purposes. This engine is to be coupled direct to a dynamo.

Messrs. W. C. Holmes and Co.

(Stand No. 10.)

This well-known and old-established Huddersfield firm are showing in the heavy machinery section one of their patent scrubber-washers arranged for the extraction of cyanogen and ammonia. The machine is fitted with glass front and sides, so that the internal mechanism can be seen. The firm are also exhibiting an improved Pelouze and Audouin tar-extractor, together with automatic bye-pass fitted to the drum. Further items are double faced "Western" valves and quick opening blast-valves, as used in conjunction with carburetted water-gas plants; also a patent blast and steam box for the bottom of generators in carburetted water-gas plants.

Dudbridge Iron-Works, Limited.

(Stand No. 11.)

The exhibit of this Company consists of two of the Dudbridge gas-engines—a 13½ brake horse power, and a 16½ brake horse power—one being of special design for electric lighting. Arrangements have been made for the utilization by other exhibitors of all the power generated by these engines.

West's Gas Improvement Company, Limited.

(Stand No. 12.)

A fine collection of plant has been brought together by West's Gas Improvement Company, Limited; and the interest found here will not be exceeded by any other stand, though it may be equalled. In the first place, there is a quarter full-size working model of a West coke-conveyor, illustrating its application to a retort-house for conveying hot coke to a hopper in the yard; this hopper being supported on columns, and provided with an outlet which may be arranged for filling railway waggons, carts, &c. In the model, the coke is delivered from the retort-house conveyor to another conveyor, which may be placed in any position in relation to the retort-house conveyor for the purpose of storing the coke in a yard, or conveying it to a coke screening and storing plant. There are several special features in the West improved patent hot-coke conveyor chain; among the most important being the provision for reducing the wear of the working parts of the chains and chain-wheels. The joint pins and wheels have exceptionally large bearing surfaces; and the trough along which the chain travels is provided with a renewable cast-iron bottom. The Company have now supplied a number of these conveyors; and, in addition to the working model of the conveyor, there are on view several drawings showing the general arrangement of the installations. On the working model of the coke-conveyor, a portion of a retort-house is seen, illustrating the front view of West's patent regenerator furnaces and settings. As is known, the firm make a speciality in the building of retort-settings, both for the horizontal and inclined systems. One of the special features in these furnaces is the construction of the air and waste gas flues, which are divided by a vertical division wall built up of special tiles, panelled to allow as much heat as is possible to be transmitted from the waste-gas passages to the secondary-air passages; and, in addition, these walls are so built that they are not affected as regards liability to short-circuiting due to the disarrangement of the flues through expansion and contraction. Several drawings illustrate the installations of retort-house plant, with regenerator furnaces and settings erected by the firm.

The application of compressed air for driving machinery has, for many years, been an important branch of the firm. Their compressors have a very high efficiency; and as in driving stoking machinery they are required to be in operation during the whole of the twenty-four hours, they are well proportioned for long running without stoppage for repairs or attention. It is, in connection with this statement, a significant and noteworthy fact that there are many installations of air-compressing plants for stoking machinery in operation where there is no duplicate plant in reserve. On the stand is exhibited one of West's entirely enclosed double-cylinder reversing motors, specially designed to be driven by compressed air.

The manual charging and drawing machines are the earliest type of apparatus made by the firm; and these are still very popular and obtain good results. In connection with this class of machine, an improved patent charger is exhibited. This has now been at work for several years, and most successful results have been secured from its working, as it enables a larger charge of coal to be deposited in the retorts than by the older type of charger, and the coal is distributed in the best possible way to enable the charge to be properly carbonized. A model is exhibited of Hovey's patent indicator for ascertaining the depth of coal and other materials stored in hoppers. This apparatus has been found very useful in connection with the overhead coal-hoppers supplied with the Company's charging machines, as it enables the coal-breaker attendant to ascertain the amount of coal in the overhead hopper without the necessity of ascending to the hopper. Consequently, his duties are considerably minimized by the use of the apparatus.

The West combined tar and regulating liquor seal valve for use with the hydraulic main is also shown. Another of the exhibits is the "Bournemouth" arch-pipe, which is designed to facilitate the operation of cleaning out the ascension-pipes. By its peculiar construction, it likewise reduces the risk of stoppage in the upper end of the pipe to a minimum; and there is really no part of the pipe on which an accumulation can lodge. Several patterns of the firm's own manufactured stamped steel chains and chain wheels for elevators, conveyors, and driving purposes are on view. Another section of exhibits are a number of samples of the silica fire-bricks, blocks, and tiles manufactured by the Derbyshire Silica Fire-Brick Company, Limited. These fire-clay goods are largely used in the construction of West's furnaces and settings, as they have a reputation for great fire-resisting and other properties. Apparatus for relieving the pressure in hydraulic and gas mains when retorts are closed down temporarily is represented by the exhibit of a "Belton" patent relief apparatus. Special attention may be called to a number of drawings and photographs of installations of stoking machinery with coal and coke handling plants actually carried out by the firm. These drawings illustrate the application of both the compressed air-driven stoking machinery, of the separate charging and drawing machines and combined charging and drawing machine types, as well as of the manual stoking machines.

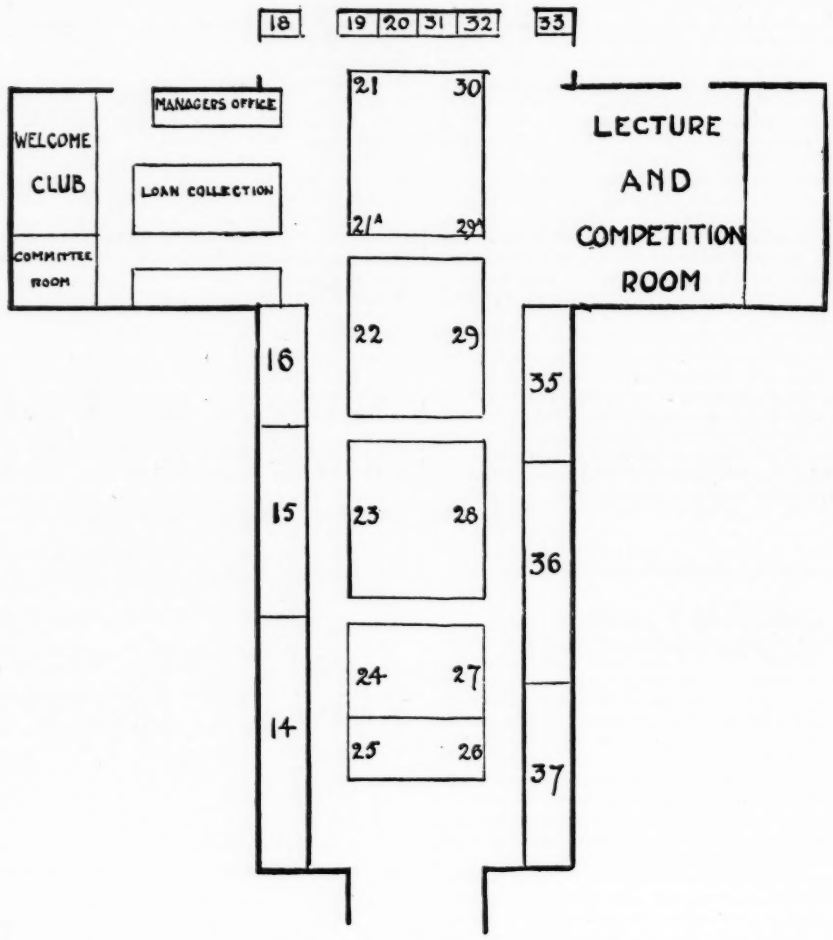
Messrs. Graham, Morton, and Co., Limited.

(Stand No. 13.)

One of the first stands which meet the eye upon entrance to the exhibition is that in the occupation of Messrs. Graham, Morton, and Co., Limited; and, with their usual enterprise, the firm have given the engineering visitors something original in conception and well worth inspection. There is, however, no occasion to describe it here, as two illustrations and an explanation of the design appeared in last week's issue. As then stated, "the exhibit embodies five different designs of conveyors, applicable for handling coal and other heavy material. The original idea of the design has been carried out in its entirety, whereby the coal is continually and automatically passing round the whole of the plant, and through each portion of the apparatus."

IN THE DUCAL HALL

(Gas-Stove Section).



PLAN OF STANDS.

Messrs. Wilsons and Mathiesons, Limited.

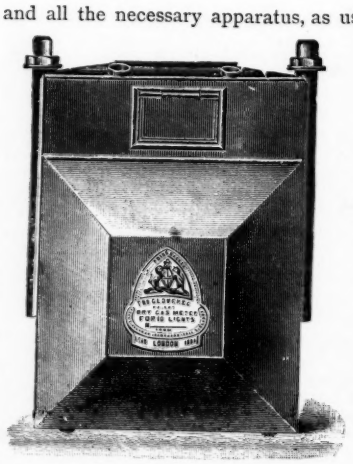
(Stand No. 15.)

As usual, this firm have brought together a comprehensive group of their special manufactures in the way of gas-stoves for cooking and heating. In addition to these classes, note must be made of the water-heating appliances both for large and small quantities of water, and either for storage or continuous supply. A special feature is apparatus for fixing to the existing hot-water apparatus in the house, either to assist the heating of water with the coal-fire, or to heat water when the coal-fire is not in use. An exhibit which will attract the ladies is a gas washing copper for boiling clothes, to replace the old-fashioned and dirty method of heating by coal; and in the same class are arrangements for boiling water for cooking purposes, as required by provision dealers, butchers, &c. Combination ranges, with ordinary coal oven and fire and a gas-cooker under the same chimney opening are striking exhibits. In connection with gas-fires, the specimens of the "Wilson" portable gas-fire as invented and manufactured by the Company in 1878 will be noticed, as will also be the "Register" gas-fire, made in four sizes, to fit the ordinary register grate. This type of fire, it is mentioned, was designed and supplied by them in 1901. Internally heated gas-irons and an assortment of the Company's well-known artistic gas-fires are intermingled with the other exhibits.

Messrs. Thomas Glover and Co., Limited.

(Stands Nos. 14, 25, and 26.)

Here are shown a good selection of the noted manufactures of the above-named firm. In one corner of the stand (No. 14) is a collection of every size meter from 1-light to 1000-light; and, in another, prepayment meters of all sizes for pennies, sixpences, and shillings, with the latest improved prepayment attachments. Two glass meters are also shown, to illustrate the working of the mechanism of the latter. Pressure gauges of all sizes and shapes from 6 inches to 48 inches are dotted about the stand; and a splendid pair of testing holders is shown, complete with table, and all the necessary apparatus, as used by the various public



authorities for testing and stamping meters under the Sale of Gas Acts. Directly opposite, on the other side of the gangway, there is the exhibit of the firm's new patent "Gothic" gas-engine. This engine has an impulse every revolution; is valveless and automatic; and drives the installation of Sale and Onslow's high-pressure lighting, which illuminates the stands and right half of the Ducal Hall. This will give those who have not seen this new feature of Messrs. Thomas Glover and Co. an opportunity of inspecting it in working order. In addition to the above, there are various brass stampings up to $\frac{1}{2}$-inch in thickness exhibited, together with cheaper samples from the sheet for medals and badges, up to 6-inch stamping. This latter exhibit is from the firm's Birmingham branch; but it includes manufactures obtainable at all its branches—Manchester, Birmingham, Bristol, Glasgow, Belfast, Falkirk, and Melbourne (Australia).

Messrs. R. & A. Main, Limited,

Will occupy the same stands as the above-mentioned firm, and are making a representative exhibit of their high-class productions. There are gas cooking-stoves (enamelled), embodying the most recent improvements—clear crown plate, improved movable burners, and extra large hot-plates. This, it is stated, is the only

cooker supplied with enamelled interior fittings. Other lines are the gas cooking-stoves for installation with slot meters. These are of excellent design, and can be supplied in six sizes to suit all customers. The gas-grills and boiling-stoves, for home or hotel use,

One of Messrs. Main's New and Attractive Designs.

must be noticed, and special attention be given to the gas-fires. Here we have a new series of handsome designs, specially brought out to suit this season's requirements. Among the features, it is observed that the burners and bricks may be removed by hand for cleaning without having to disconnect the fire. Original and efficient designs are shown in condensing-stoves, together with some cheap and useful reflector-stoves. Notable exhibits are the hotel roasting ovens, which are suitable for any large kitchens. A gas baking-oven is shown (such as obtained a gold medal at the Paris Exhibition in 1900), and is claimed to be the most efficient and economical oven constructed.

Flavel Range and Imperial Stove Company.

(Stand No. 16.)

The progress which this Company have made in the production of gas cooking and heating appliances is well known; and their stand is the illustration of that progress. Foremost the visitor will be attracted by an imposing and substantially made carving table, with its copper cover, copper utensils, and *bain marie*. The lifting-gear for the covers is ingeniously and ornamentally arranged; the balance weight having the medallion of the Company's trade-mark worked in in a very effective manner. A hot plate for kitchens of large establishments also shows care in designing. These hot plates are so constructed that any part can be easily replaced when worn out; and it lends itself readily for taking to pieces, and packing away. A griller on a stand with double hot closets over has a double service of burners—each independent; and each burner has its own supply cock, so that the minimum or maximum amount of grilling can be done equally economically. An excellent feature of these hot closets is that the ovens are complete in themselves, have no fumes passing through them, and are so completely surrounded by the waste heat that they would serve for baking.

A portable gas water-boiler suitable for the soup kitchen, the caterer, or the laundry, differs from the general run of similar boilers on the market, inasmuch as it is made of stamped steel, galvanized or tinned, and, from the thinner material used, gives great advantage in economy in gas consumption and rapidity in boiling. An important feature of this light boiler is that it is provided with internal handles and can be lifted bodily out (with its contents) and carried to a distance, when desirable.

A series of tailors' stoves made in sizes for one, two, three, four, and six irons shows a number of special features, and well worth inspection. A further novelty is a small tinman's stove, which goes together without nuts or screws, and is convenient for packing in a workman's bag.

A series of "Imperial" cookers—made in eight sizes suitable for the small household to the large hotel—makes an imposing display. They are provided with hinged cornices which can be raised for cleaning purposes; the burners are all loose, making cleaning or renewing simplicity itself; and the connections are so arranged as to give the least possible trouble when overhauling is required. A double "Imperial" cooker illustrates an arrangement of two or more cookers of any size being fitted in a range with one continuous hot plate.

One special "Imperial" cooker is shown, fitted with a patented arrangement for supplying hot water. From a circulating tank in a hood fitted to the cooker, the water passes through a flue arrangement, whereby the waste heat from the oven is utilized. The water then flows through copper tubes over the oven burners, and then back to the circulating tank. The result is said to be that "an ample supply of hot water is obtained without increase in the consumption of gas, and without detracting from the effectiveness of the oven."

The heating stoves shown form a fine display—the finish and general design leaving nothing to be desired. The Company's loose front fire (whereby several fronts are fitted to one stove, so that a customer can have the pattern he prefers) enables the ironmonger or gas company to have considerable variety without heavy stocking, as fronts only need be stocked.

Among the additions to the Company's catalogue are a very handsome condensing stove, "King Edward VII.," and an elegant fire called the "Alexandra." The latter is finished in several different ways, brassed, bronzed, tiled, &c., and is particularly effective.

Messrs. Henry Balfour and Co., Limited.

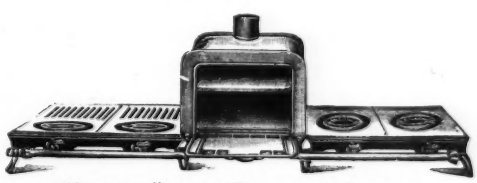
(Stand No. 18.)

The exhibit of Messrs. Henry Balfour and Co., Limited, is a small one; but it is not lacking in interest. It consists of, first, a cast-iron retort mouthpiece, fitted with self-sealing lid, and a new form of fastening, called the "Centrelock." The lid, after being closed, is secured by a half-turn of a central lever, which imparts a considerable amount of side motion to the lid before the final action of compression between the lid and the lip of the mouthpiece takes place. This mouthpiece fastening and lid is in use in several large gas-works, and is also being used in a small gas-works where no exhauster is employed; the joint being absolutely gas-tight against a pressure of 5 inches of water, and has remained so through twelve months' use. The firm exhibit one of their "Anderson" four-way change valves, specially adapted for use where a bye-pass arrangement is required. The valve is fitted with an indicator, showing the direction in which the gas is passing; and the diaphragm is provided with a relieving screw, which, on being put into use, admits of its being turned without any frictional strain.

Herr F. C. Fertig.

(Stand No. 19.)

A small stand, but one which does not fail in presenting points of interest, is that on which are shown samples of the patented cooking and heating apparatus of the Hamburg house of Herr F. C. Fertig. The respects in which they are said to excel are in the extraordinary perfection of the admixture of gas and air; and consequently in the small consumption of gas and high heating power. In the case of the "Victoria" stoves, the admixture is stated to be composed of nearly five parts of air to one part of gas, and in the "Triumph" stoves even more than six parts of



"Victoria" and "Triumph" Cookers.

"Victoria" Stove.

"Triumph" Stove.

air to one part of gas. The "Victoria" stoves, with a consumption of 10½ cubic feet of gas per hour, have a cooking surface of 200 square inches; and the "Triumph" stoves, with a consumption of not quite 10 cubic feet of gas per hour, a cooking surface of 350 square inches. One of the chief points of the "Victoria" stoves is the special burner, which is so constructed as to direct small flames to the front and large flames to the back part of the

stove. The burner is fixed in the front of the stove; but, the back part being much larger, it is necessary to have larger flames sent in that direction. The top at the back of the stove consists of specially constructed ribs along which the heat glides, and which give forth an intense heat. This is another outstanding feature in the construction of the stove. In the "Triumph" stoves, the outer air is preheated in a special manner, and made to flow rapidly through the stove; and this creates a flame of such intense heat that it can be used to melt enamel. The "Triumph" patent not only refers to the construction of cooking and heating apparatus, but to furnaces for smelting works. An intense heat, with an extremely small consumption of fuel, can, it is claimed, be obtained from furnaces built upon the principle covered by the patent. The stoves are also being made for use with spirit gas.

Messrs. George Scott and Co.

(Stand No. 20.)

At this stand are to be found the specialities of the above firm, whose name has not yet become prominent among gas-stove makers. They are, however, now asking for the consideration of both gas suppliers and users for their patent portable gas cooking stove. They say it supplies the want of a portable stove which can be lifted about by one person and stood anywhere—say, on the top of a close fire-range when the latter is out of use in summer. The gas-jets are not exposed anywhere, but are confined in a separate chamber; the heat from them circulating

Scott's Patent Portable Gas-Cooker.

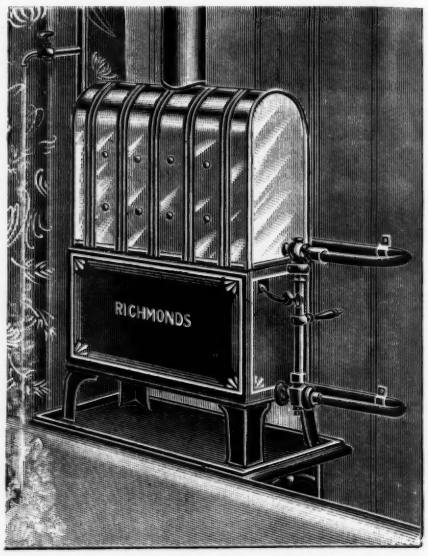
round the oven and heating both it and the hot plate. No jets are therefore required on the hot plate for boiling the saucepans; the jets in the heating chamber doing it all. The vegetables cook on the hot-plate the same as on a close fire-range. These facts suggest great economy in gas consumption; and the patentees guarantee that a stove with a 14-inch oven costs under ¾d. per hour for gas at 3s. per 1000 cubic feet.

The Richmond Gas Stove and Meter Company, Limited.

(Stands Nos. 21 and 30.)

The Richmond Gas Stove and Meter Company, Limited, have a fine stand, in a good position; and they have fulfilled their promise to give something out of the common in the arrangement of the exhibit. They make a thoroughly representative display of all the different goods they manufacture, ranging from a modest boiling-burner to hotel apparatus—similar (this is an item of news to the public taste) to what they have lately supplied for the Vatican at Rome. Special attention is drawn by the Company to their new finish "Porcellanite," which, it is expected, will largely take the place of bronze finishes, which have never been quite satisfactory. Their fires can now be had in eight colours—permanent and artistic—suitable for harmonizing with any scheme of room decoration; and examples of these are on show. Notice should also be taken of their slot cookers and fires, of which there is a good selection suitable for supplying with prepayment meters; the "Crusader" new series of larger cookers, many points of which are decidedly up-to-date; the new pattern fires, the "Connaught" and "Guildhall;" and the instantaneous bath-heaters, particularly No. K471.

Some particulars may be given of this water-heater as an example of one of the firm's most recent departures. This heater catches the eye for its oblong shape, being, in this respect, contrary to the usual form of circular gas geysers. In this lies one of its improvements: It will readily fit on a shelf or ledge against the wall next to the bath; so taking up a minimum of space. The lower part of the body is encased in cast iron; while the upper portion is a canopy of copper—a flue pipe at the top carrying away the burnt gases. Attached to the side is an upright hot-water pipe, which permits of a double duty—the filling of the bath, and the shower-bath arrangement. The working of the pilot light, and the automatic turning on and off of the gas and water supplies concurrently, are the same as in the arrangement of the firm's other well-known water-heaters. A child can easily understand the mechanism, and may safely be entrusted to use the heater. On the point of consumption, it is claimed for the duty obtained that the gas consumption is much lower than in any other make of heater on the market. A supply of 20 gallons of



Richmond's Patent Gas Water-Heater.

water to a bath can be had at the cost of under a penny, reckoning gas at 2s. 10d. per 1000 cubic feet. Hot water can be instantaneously delivered at the rate of 1¾ gallons per minute, and heated to a temperature of 150°. The firm have brought this water-heater out—adding one more article to the list of things for hiring purposes—with a view to gas companies hiring it out to their consumers. This has been borne in mind in its construction; it having been so arranged that cleaning and repairing can be done at a minimum of cost and trouble.

Among other improvements in gas-fires, attention may be drawn to the swing fender of many of the patterns on view. By swinging open the fender, the burner is easily removable by the hand for cleaning purposes; and, perhaps more important still from a gas manager's point of view, each burner has a patent adjustable nipple attachment. This is simplicity itself; and it regulates for varying pressures, water gas, &c.

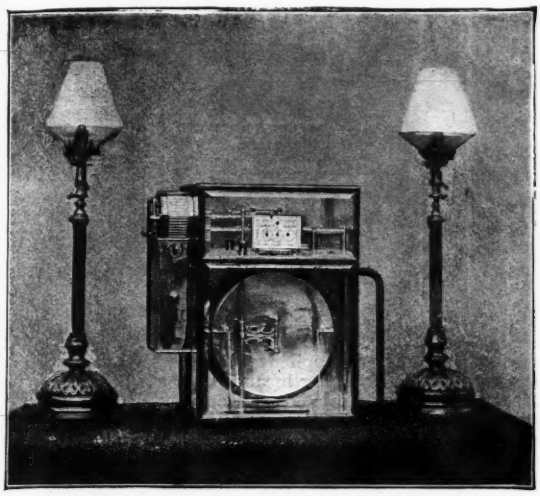
Two curious exhibits on the stand are: An old gas-cooker made in the forties, and used at Wellingborough, when gas was 15s. per 1000 cubic feet. Side by side with Richmond's modern "Model" cooker, it well illustrates the progress that has been made in half-a-century in gas-stove manufacture. There is also a small piece of wood and tape that formed part of a gasholder in use for many years between 1848 and 1875.

Messrs. George Glover and Co., Limited.

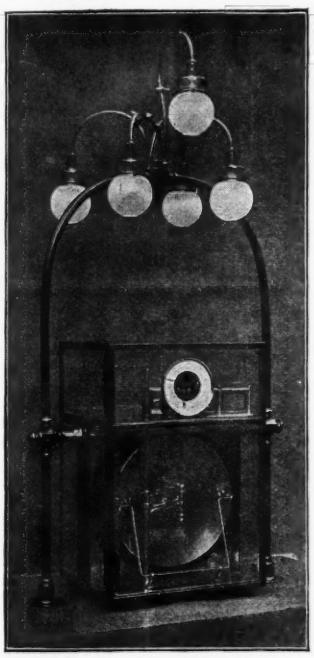
(Stand No. 21A.)

An appropriate introduction to the exhibits of this firm are a number of certificates of awards made to them at the various International Exhibitions for a period of more than forty years. These, framed and displayed, form a background to the stand. Turning to the exhibits, we notice first a prepayment dry meter (of the new "price changer" pattern), in a bevelled glass casing. This is the latest pattern of slot-meter made by the firm, in which a "lantern wheel," of novel construction, is actuated by the coin. The quantity of gas delivered for each coin is readily adjusted by altering the position of the "shield-ring," a projecting tooth in which can be inserted in either of a series of numbered notches prepared for its reception. The automatic mechanism has comparatively few parts; and there is no spring in any portion of it which is actuated by the meter. An ordinary dry meter in bevelled glass casing is more than usually interesting from the fact that it is similar to those exhibited by the firm at the International Exhibition in London in 1862 and many times since. This meter is connected with gas, so as to show the working parts in motion. An ordinary 150-light dry meter, measuring the gas for one burner, is seen fitted with a test-meter dial, with a 5-feet outer circle. The beauty of the workmanship in making and fitting the internal parts of these large "instruments of precision" will be readily understood from the fact that even the microscopic movements occasioned by the burning of one jet of gas are accurately registered by the meter. A standard test gasholder shown is a facsimile of the 5-feet "National" standard test holder now in use at the Standards' Department, Westminster. These standards were designed by Mr. George Glover, and were made under his super-

vision. The bell is of an anti-corrosive alloy, drawn as a tube; the scale being engraved on the bell itself. It is interesting to remark in this connection that the Astronomer Royal reported that these instruments were "entirely fitted to maintain the character of our national standards," and were "as accurate as it is possible for human skill to make them." A case of padlocks, including among others the "M and M" improved patent padlock



GEORGE GLOVER'S "PRICE-CHANGER" SLOT METER.



GEORGE GLOVER'S DRY METER.

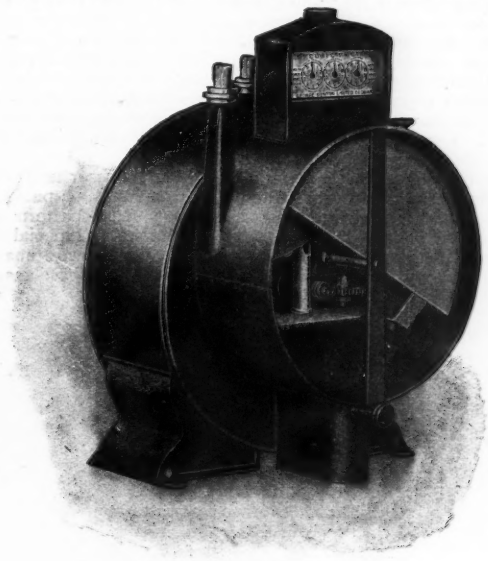
for prepayment meters, is exhibited; and a curiosity is an old British dry meter, with four diaphragms working on the beam principle.

Messrs. George Newton, Limited.

(Stand No. 29a.)

This allied branch of the Richmond Gas Stove and Meter Company, Limited, are showing goods arranged on the end portion of the above-numbered stands. Their specialities consist of wet meters, ordinary and prepayment, in cast-iron and best tin-plate cases, with compensating drum, and unvarying water-line. There is also a selection of brass main-taps, lamp-taps, &c., every item of which is made of the best gun-metal and finished by skilled workmen. On another board is a complete set of the component parts of a wet meter, showing the substantial quality and high-class finish of each part. A novel feature is a working model of a wet gas-meter, with glass back and front, showing the action of the various parts. The remainder of the exhibits consists of pressure gauges, a 400-light cylindrical station meter, and sundry brass fittings—lamp taps, elbows, tees, unions, &c., and special brass fittings for gas-fires.

Among the fittings is to be seen the "Quick Connector" (as shown in the "JOURNAL" for April 19, p. 153), consisting of a brass main tap with screw connection for lead or compo. By slightly widening the end of the compo. piping, it can be securely



NEWTON'S UNVARYING WATER-LINE GAS-METER.

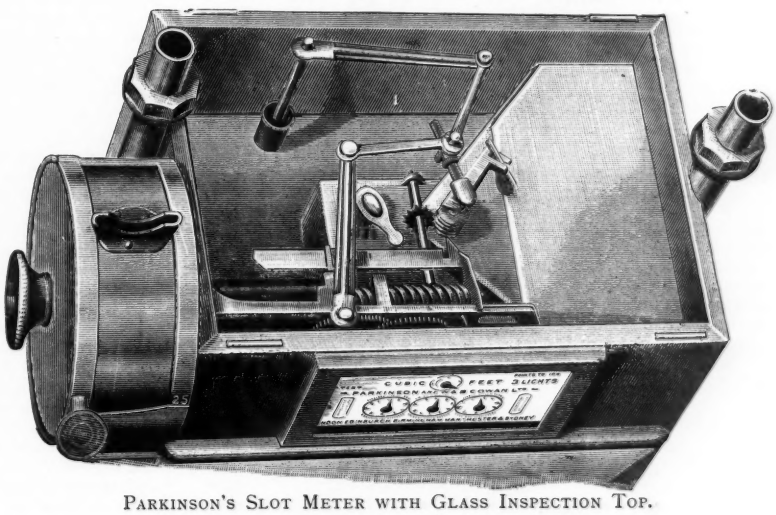
seated between the male and female bevels, and screwed tight, the same as an ordinary union joint. The advantages are that it makes a thoroughly efficient and inexpensive joint, and saves time in fitting.

Messrs. Parkinson and W. & B. Cowan, Limited.

Parkinson Branch.

(Stands Nos. 22 and 29.)

This stand is attractively decorated in art green, relieved with white enamel. In the centre is a small office, at the four corners



PARKINSON'S SLOT METER WITH GLASS INSPECTION TOP.

of which are radiating wings, the spaces thus formed being fitted up as follows: (1) Fireplace with overmantel, fitted with a "Crown" gas-fire. (2) Complete set of fittings for prepayment installation, consisting of slot meter, small gas-cooker, pendants, brackets, boiling-burners, &c. The remaining two are fitted with gas-fires and various articles of the firm's manufacture, all tastefully arranged.

Taking a general survey, the exhibits comprise ordinary wet and dry meters; prepayment meters; models of station meters in both rectangular and cylindrical cases, station governor, test gasholder; a 12-inch station governor; a 5000 cubic feet per hour station meter with glazed front, several meters, both ordinary and prepayment, fitted with glass cases; an advertisement meter, fitted with illuminated revolving cylinder, carrying advertisements (this is particularly suitable for exhibitions or gas companies showrooms); a set of standard meter unions, as approved by the Board of Trade; a test gasholder of 11 cubic feet capacity; a low-pressure water-meter; a rain gauge, in action; an experimental

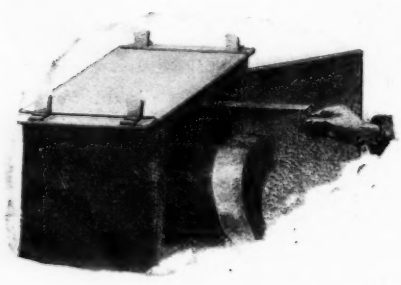
meter; and a King's gauge. There is also a polished case, with an assortment of various pattern gauges made by the firm; as well as pressure-raisers, thermometers, lamp cocks, &c.

Special attention is drawn to the models of station meters and governors, also to the 12-inch station governor, and the 5000 cubic feet per hour cylindrical station meter, which is fitted with glazed front; the measuring-wheel having the partitions painted in various colours, and the pressure-register, handsomely japanned in cream and gold, and fitted with a clock, having a glass case, to exhibit the works; also to the various classes of meters, with glass cases, valve plates, &c., exposing the whole of the interior to view. That of the slot meter is well worth inspection, showing as it does the simplicity of the firm's pattern.

In the gas-stove section, there is a large assortment of gas-cooking stoves for ordinary domestic use, hotels, or public institutions, and the artizan classes; a variety of the patterns shown being very suitable for hiring-out to consumers. A special display is made of the "Crown" series of cookers, which are enamelled lined, and with or without enamelled exteriors. These gas-stoves

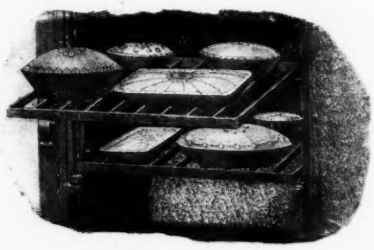
Parkinson's "Crown" Cooker.

embody many important improvements. There is the sliding meat-hook, which enables food to be easily removed from the oven. The self-locking grid-shelf dispenses with the necessity of stooping to inspect the cooking, and prevents the possibility of drawing the shelf out too far, and so precipitating food to the ground. The graduated grill-pan grid is a simple contrivance for obtaining various distances of the grid from the grill burner.



Sliding Meat Hook.

Many patterns of cookers for prepayment consumers and others are shown in different sizes, with special features to suit various requirements. A large gas-range is on view replete with all modern conveniences, consisting of two ovens and a continuous hot-plate, suitable for hotels, restaurants, &c.; also a variety of gas heating-stoves to suit all kinds of fireplaces, and in a number of sizes and designs—some fitted wih art tiles, and others finished in silver, bronze, or gold. A modern fireplace is shown complete, with gas-fire arranged to harmonize in style and finish; also a special display of gas-radiators, with closed burners or open fires. These are constructed for use in halls, shops, public institutions, &c., and give most satisfactory results. They are chaste in design and finished in various tints. A complete slot installation is fitted up complete on the stand—comprising a penny-in-the-slot meter, a suitable cooker, brackets, pendant, &c. Special apparatus in the form of a gas-heated washing-machine, clothes dryer, &c., is noted, as well as a varied assortment of grillers, boiling-burners, &c., utensils for use in connection with gas-stoves



Self-Locking Grid.

generally, and other gas appliances for the workshop and home. Samples of street-lamps for incandescent gas lighting complete, with ornamental lamp-columns, are on view. The notice of the exhibit would not be complete without reference to the large number of photographs on view, including several of the various testing-stations both in London and Provincial towns that have been recently fitted up by the firm complete with gasholders, testing-tables, King's gauges, leakage-meters, &c.

Messrs. Fletcher, Russell, and Co., Limited.

(Stands Nos. 23 and 28.)

An imposing display is made in a good central position by Messrs. Fletcher, Russell, and Co., Limited; and it would be as difficult to point out what is unrepresented here in the way of gas stoves and appliances for domestic and industrial use as it is to say with certainty that we have succeeded in listing all the firm have on view. It is a good exhibition, with which is identified care in construction and finish and a wide range of utility. Here we have cookers large and cookers small, and cookers specially designed for slot purposes. Grillers, steamers, water-boilers, a handsome carving table, large ovens for confectioners, and hot-plates come under notice. Observation is made of the rapid water-heaters for baths; and then the gas-fires claim attention. In mantels and overmantels, the firm have established a reputation for clean casting and embellishment of artistic merit. There is quite a profusion of other articles, such as curbs, reflector stoves, warm-air stoves, radiator stoves, wash-boilers, boiling-burners, smoothing-irons, smoothing-iron heaters, coffee-roasters, cooking utensils, greenhouse boilers, and special taps. Coming to workshop gas appliances, we find tinmen's stoves, soldering bolts, soldering iron heaters, safety glue-pots, bunsen burners, tube furnaces, blow pipes, muffle furnaces, foot blowers, crucible furnaces, oxygen furnaces, and ladle furnaces.

A novel feature is the kitchen, which is shown fitted up with cooking apparatus, suitable for use in hotels or large institutions; the suite exhibited being capable of cooking for some 200 to 250 persons. It consists of a large double-oven range, roasting and pastry oven, griller, vegetable steamer, large roomy hot-plate, and carving-table. An adequate supply of hot water for all cooking operations is furnished by a multitubular boiler. By the adoption of this system of cooking, absolute cleanliness, precision, and dispatch in handling large quantities of food, are obtainable. A bath-room is also shown fitted complete; the hot-water supply for the bath being obtained from the firm's well-known "Rapid" water-heater, which is capable of delivering 2 gallons of water, heated from 60° to 110°, per minute. An efficient flue is absolutely necessary with these heaters, to carry away the burnt gases. Connected with this heater is a large storage reservoir (Price's patent), in which sufficient hot water may be stored so that three or four baths can be filled from it without any delay, as is often a requirement in large institutions, schools, &c. Two other patterns of water-heaters are also shown, which are specially designed for fixing to walls; being semi-circular in form, and thus economizing space. These are particularly suitable for supplying hot water for lavatories, &c. It may be mentioned that the bath itself and the lavatory stand shown are also manufactured by the firm.

The gas-cookers, of course, form a leading line in this exhibit; and samples are on view, in sizes ranging in capacity for cooking for 4 to 100 persons—including the small "Slot" cooker hired out by many gas companies with prepayment meters. Prominent in this selection may be seen the "Connaught" range, a large three-oven cooker, the original pattern of which (history may be enriched by the record) was specially designed for H.R.H. the Duke of Connaught. A large oven for confectioners' use is also on view. As to the number of grillers and boiling-burners to be seen, all that need be said is that many thousands of them are in

THE "CAWNPORE" FIRE.

THE "SINGAPORE" FIRE.

daily use in all parts of the world. Comment on the usefulness of these inexpensive articles is, therefore, needless.

There are quite a number of smoothing irons and iron heaters for use in private houses, laundries, &c.; and it is pretty safe to say that anyone having one of these internally heated irons properly fixed, in accordance with instructions supplied, will never revert to the old system of heating before a roasting fire.

The selection of fires, in various high-class finishes, for all rooms and buildings is a splendid and extensive one. Special attention is drawn to the patent ventilated backs which have been adapted to a number of the firm's standard pattern of fires. In this arrangement, the induced draught caused by the burner is conveyed through a series of holes in the back of the fire, carried up behind the brick, heated during its progress, and discharged into the fire almost at the top of the brick. This warm current has the effect of deflecting the point of the flame outwards from the brick—thus causing the flame to travel up the outer row of balls, or on the front of the frets, instead of being drawn inwards towards the brick as in the old pattern. In several of the fires, this arrangement rendered it necessary to raise the total height of the fire, and consequently the fire surface has been increased. This adds greatly to the efficiency and brilliance for the same gas consumption as in the old patterns.

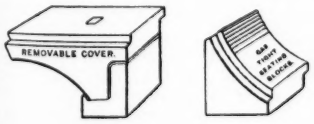
Some very pretty and effective suites—including mantels, overmantels, fire, tiled recess and hearth, with curb and brasses—cannot escape notice. These are admirably suitable for drawing-rooms, dining-rooms, and morning-rooms. Several more of Messrs. Fletcher, Russell, and Co.'s suites are fixed in the rooms furnished by the Gaslight and Coke Company; and these are well worth the inspection of intending visitors.

A unique feature of the firm's exhibit, which, we are sure, will appeal, not only to scientists, but to the managers of commercial and industrial undertakings, is the varied display of apparatus for use in laboratories and workshops.

Adjustable Cover and Boiler Block Company.

(Stand No. 31.)

At this stand, attention is turned to the consideration of overlapping gas-tight fire-brick flue-covers and seating-blocks. By means of a wooden model of a half-section of a Lancashire or Cornish boiler, the utility of the Company's adjustable covers is demonstrated. The covers have hand-holes for lifting, and, overlapping on their sides, and setting in their fire-brick seats, their positive contact is shown. It will be seen that the covers can be easily raised, without displacing the brickwork; so admitting daylight, and affording greater facility for the inspection of the boiler. The seating blocks overlap on the sides, and act as a barrier to short-circuiting of the heated gases into the adjacent flues. These blocks are also shown in contact with the boiler. Combined, these arrangements secure a gas-tight fire-brick flue for the furnace gases to pass along; and this must conduce to safety, efficiency, and economy.



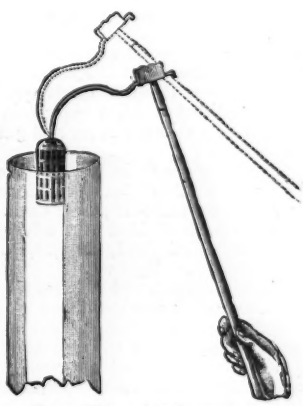
Messrs. Baer and Co.

(Stand No. 32.)

Self-lighters of many different designs, and for every practical use, will interest the visitor at the stand of the Berlin firm of Messrs. Baer and Co. First of all there is the portable gas-lighter in the shape of pear, and another portable lighter of aluminium, the pocket and telescopic lighter, the cooking and heating-stove lighter, the two-way tap lighter, the smoke-top lighter, and the "Lux" lighter. Self-lighters fixed to each gas-lamp have not as yet come into favour in this country. Many attempts have been made to introduce them; but without much success. Perhaps Messrs. Baer and Co.'s exhibits will give a fillip in this direction. The two-way tap lighter is no doubt a very good one, when fixed by a trained man; but the smoke-top lighter any one can place on the top of a lamp without special care. This form of lighter is stated to be much in vogue in France, Italy, Austria, Hungary, and Germany—countries where chimneys of at least 8 inches high are very generally employed. Such high chimneys, however, are not used much in this country. A 6-inch one at most is regarded as sufficient. It is cheaper, and does not break so quickly as an 8 or 9 inch chimney. But these low chimneys are not satisfactory for the smoke-top self-lighter, inasmuch as when exposed so closely to the direct heat of the burner the lighters will melt, and the whole fixture is soon spoilt.

THE "SIMPLEX" LIGHTER.

THE "LUX" LIGHTER.



THE "URSUS" LIGHTER.

To overcome these difficulties, Messrs. Baer and Co. have produced quite a new shape of self-lighter, especially made for English gas and lamps. This is the "Lux" lighter. It is made of a material that the makers confidently say will stand any heat, and its simple construction permits its sale at a very low price. This is the lighter to which special attention should be paid when inspecting the stand.

Messrs. William Sugg and Co., Limited.

(Stands Nos. 24 and 27.)

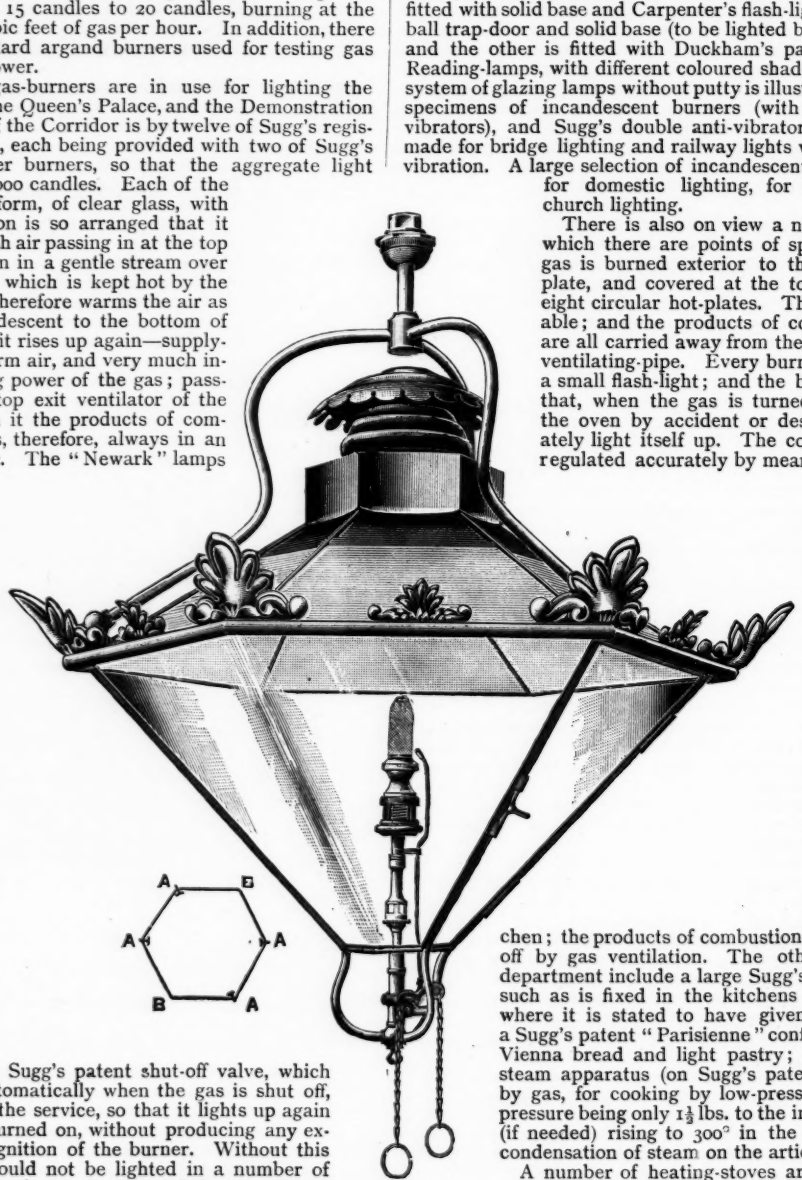
Old-established but modern in their productions, at the stands of Messrs. William Sugg and Co. are seen all kinds of apparatus and appliances of an up-to-date order for lighting, heating, cooking, and ventilation. The lighting is subdivided into two heads —viz., lighting by high-pressure incandescent gas and low-pressure incandescent gas, besides low-pressure cone-top flat-flame burners, of from 15 candles to 20 candles, burning at the rate of from 4 to 15 cubic feet of gas per hour. In addition, there is a collection of standard argand burners used for testing gas from 14 to 20 candle power.

The high-pressure gas-burners are in use for lighting the Corridor, the front of the Queen's Palace, and the Demonstration Room. The lighting of the Corridor is by twelve of Sugg's registered "Newark" lamps, each being provided with two of Sugg's patent 500-candle power burners, so that the aggregate light of each lamp will be 1000 candles. Each of the lamps is of egg-shape form, of clear glass, with no ribs. The ventilation is so arranged that it allows the incoming fresh air passing in at the top of the lamp to flow down in a gentle stream over the top of the reflector, which is kept hot by the gas underneath it, and therefore warms the air as it passes over it in its descent to the bottom of the lamp. From there it rises up again—supplying the burners with warm air, and very much increasing the illuminating power of the gas; passing finally out at the top exit ventilator of the lamp, and carrying with it the products of combustion. The burner is, therefore, always in an atmosphere of fresh air. The "Newark" lamps are each fitted with a cup-and-ball, specially devised and patented by Mr. Sugg. This permits of the lamp being turned round for cleaning purposes, and supplies high-pressure gas to the high-pressure burner and low-pressure gas to the flash-light. The pressure on the high-pressure burner is 16 inches (column of water), and on the flash-light 1½ to 2 inches — the ordinary pressure of the street mains.

The Demonstration Room is lighted by six "Taj" lamps, each fitted with three of Sugg's 500-candle power high-pressure burners, and arranged so that they can all be turned on at once from one main-cock. Each lamp will be fitted with Sugg's patent shut-off valve, which closes the stand-pipe automatically when the gas is shut off, keeping the gas alive in the service, so that it lights up again when the main-cock is turned on, without producing any explosion at the point of ignition of the burner. Without this arrangement, the gas could not be lighted in a number of lamps without a slight explosion, because of the pipe filling itself with a mixture of air and gas when the main burners are not in use.

The Promenade in front of the Queen's Palace is lighted by four "Brixton" lamps and four specially made "Lambeth" lamps of 1000-candle power each. These eight lamps, which are fixed on posts divided over a length of 400 feet, are fitted with an automatic flash-light, so that, as soon as the high pressure is turned on, they light up.

The gas-engine which raises the pressure of the gas to 16 inches for the lighting of the front of the Queen's Palace is of only 1-horse power, working at 300 revolutions per minute, and communicating motion to a double-action pump, which pumps the gas into a cylindrical reservoir upon which is fixed a regulator, and which maintains the pressure constantly at 16 inches at the foot of the burner. The engine working in the inside of the stand raises the pressure of the gas to 16 inches for the supply of the high-pressure lamps in the Corridor, Demonstration Room, and the different high-pressure lamps fixed on the stall. There is another much smaller engine, which is worked by hot-air heated by gas. This engine supplies the pressure to six of Sugg's high-pressure burners, each of 300-candle power, and consuming 11 cubic feet per hour. There are three lamps, with two burners in each, and each one gives an aggregate light of 600 candles. The lamps are of various patterns suitable for the different requirements of shop lighting. They are ventilated in the same way as the "Newark."



Sugg's "Park Royal" Lamp.

The high-pressure lamps exhibited at the stand are: The "Park Royal," "Oxford," "Plymouth," "Stirling," "Swindon," "Sidney," "Acton," "Dundee," "Chertsey," "Newark," and "Aylesbury"—all of which are arranged for a consumption of 30 cubic feet per hour, excepting the "Stirling," which is for 40 cubic feet, and the "Oxford" and "Plymouth," which are for 10 cubic feet.

The varieties of the low-pressure lamps are too numerous to name, but three forms of the "Windsor" are shown; one being fitted with solid base and Carpenter's flash-light; the second with ball trap-door and solid base (to be lighted by the Foulger torch); and the other is fitted with Duckham's patent electric lighter. Reading-lamps, with different coloured shades, are also shown; a system of glazing lamps without putty is illustrated; and there are specimens of incandescent burners (with and without anti-vibrators), and Sugg's double anti-vibrator, which is specially made for bridge lighting and railway lights where there is much vibration. A large selection of incandescent lights are exhibited for domestic lighting, for halls, markets, and church lighting.

There is also on view a new cooking-stove, in which there are points of special interest. The gas is burned exterior to the oven with a hot-plate, and covered at the top, if required, with eight circular hot-plates. The plates are removable; and the products of combustion of the gas are all carried away from the stove by means of a ventilating-pipe. Every burner is provided with a small flash-light; and the burners are so made that, when the gas is turned on in any part of the oven by accident or design, it will immediately light itself up. The consumption of gas is regulated accurately by means of a governor, so that any temperature may be produced in the oven. Several very eminent French chefs have, it is mentioned, commended the principle on which this stove is constructed; and at the National Training School of Cookery in the Buckingham Palace Road, two single ovens on the same principle have been fitted up. A large double stove is also shown for standing in the middle of a kitchen; the products of combustion of which are carried off by gas ventilation. The other exhibits in this department include a large Sugg's patent pastry oven, such as is fixed in the kitchens at Windsor Castle, where it is stated to have given great satisfaction; a Sugg's patent "Parisienne" confectioner, for making Vienna bread and light pastry; and a low-pressure steam apparatus (on Sugg's patent method), heated by gas, for cooking by low-pressure dry steam—the pressure being only 1½ lbs. to the inch, the temperature (if needed) rising to 300° in the oven. There is no condensation of steam on the articles being cooked.

A number of heating-stoves are shown round the stand, including the "Charing Cross" fire. Some of the fires are, like the "Charing Cross," being fitted with special burners, each provided with an automatic regulator, which prevents any waste of gas, and enables the consumer to turn off one or more burners at any time—thus saving the gas at every burner turned off.

The firm are also exhibiting under the head of photometers, a four-way jet photometer for testing water gas, coal gas, and mixtures of gas. A pressure register is on view, which will work for seven days, and show the variations of pressure for the whole week. The advantage of this register is that it can be put at any part of the district, and record the daily pressure, a man only having to go once a week to change the paper. Other exhibits are Sugg's improved calorimeter, with meter complete; and a Letheby photometer of the "Charing Cross" model, made to meet the requirements of the Gas-Works Clauses Act.

Messrs. S. Clark and Co.

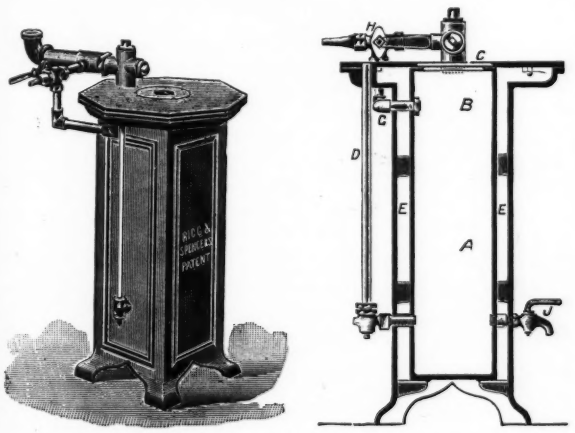
(Stand No. 37.)

At a specially prepared stand, the front of which is in the "Nouveau" style, Messrs. S. Clark and Co., of "Syphon" stove fame, are exhibiting a large number of their specialities. There are splendid examples of the "Syphon" heating-stoves, "Syphonettes," "Syphon" radiators, gas-radiators (non-condensing), bar stoves and mullers, boiling-stoves, grillers, cookers, &c.

Cannon Iron Foundries, Limited.

(Stand No. 35.)

Here we have another considerable variety of gas cookers and fires, some of a choice design. The class of hiring-out cookers is effectively represented by a range of the well-known "Hercules" cookers, fitted with the Company's special "Porceliron" oven linings, which are a distinctive feature of their stoves. They render them exceedingly durable; and the special heat-deflecting properties of the "Porceliron" are said to also enhance the efficiency. Some patterns of this class are represented (among others) by the "Chef," which is produced in two series—viz., the "A" series, with "Porceliron" oven linings, and the "B" series, with ordinary enamelled steel oven linings. The assortment of cookers specially suitable for the prepayment system is a very extensive one, and affords every choice according to requirements. Some of the stoves are of the ordinary single-cased type, while the better class are double cased, and fitted with enamelled steel oven linings. A corresponding variety of smaller articles, such as breakfast grillers, boiling-burners, &c., are in evidence. There is an elaborate selection of cooking-ranges, with double, treble, and quadruple ovens, which are strikingly represented by the No. 2049 quadruple range located in the centre of the stand. The exhibit also includes a No. 2027 double range, by which any combination or sizes of ovens can be produced to requirements. Carving-tables, hot-closets, confectioners' ovens, hot-plates, &c., are naturally well represented, as complimentary to this section. The variety in the heating-stove section is large, embodying every modern class of heating-stove, and produced in varying finishes. These impart a very attractive and pleasing effect to the display. The patterns are of a decidedly modern and artistic type, and are constructed on the most approved principles. The patented improvements enable the burners and bricks to be readily removed for cleaning or renewals, at any time, without the necessity for disconnecting the fires. Special mention is due to the radiating condensing stoves, which are shown both in the closed fire type and also with open ball fire; both kinds being fitted with the Company's patent safety valve door or canopy. Among the general domestic gas appliances, the washing-boiler is a noticeable feature, as are also the improved gas-irons with separate stand for heating. As articles of utility in all industries, the Company have included one or two representative patterns of grindstones, supplied for hand, treadle, or with pulleys) for power.



THE "CLIMAX" HYGIENIC STOVE.

At the stand the Company are also showing the "Climax" hygienic gas-stove, constructed under the patent of Mr. James Rigg and Mr. Samuel Spencer. This stove has been designed "for classes to whom gas heating has not hitherto specially appealed;" and under test, we are informed, it has proved a decided success, and has confirmed its right to be called "an effective stove for warming a room and for boiling water." The illustrations show the construction of the stove: A being the boiler, B the steam space, C the lid for filling, D an open top glass water-gauge, E a fume jacket leading to the fume-tube, F the fume-tube to chimney or outer atmosphere, G steam-pipe, H three-way steam-cock, and J hot water draw-off tap. A feature of the stove is its suitability for use in sick rooms. All the products of combustion are carried clear away to the chimney; and by means of the three-way steam-cock, any degree of humidity of the atmosphere can be obtained. Among other advantages are pointed out the economy in gas consumption, the simplicity in management, and the safety in use.

In addition to the exhibits noticed above, the Company's stand contained a few patented novelties. One of these is a stove in which the usual open burners and boiling-ring on the top are replaced by a baffle-plate, the effect of which is not only to heat the vessel upon it more effectively, but to prevent the escape into the room of any products of combustion. This is a distinct improvement. Another novelty is an attachment at the side of a heating-stove for regulating the admixture of air and gas independently, so that the stove can be used for either ordinary coal gas or water gas. This attachment is, we understand, the only one on the market. A further novelty shown will appeal specially to ladies who take an interest in the laundry work of their households. The grid on the top of the stove is so constructed that an ordinary sad-iron on the hot-plate can be covered with a shoe, by which means it is heated in about 30 seconds with half the usual consumption of gas. By reversing, the grid can be used for internally heated irons, which are heated-up very rapidly. An interesting feature of the Company's exhibits is a plate of the "Porceliron" which is their speciality for lining ovens. It affords striking evidence of the durability of this material, for it is in good condition after twelve years' wear.

A choicely printed souvenir catalogue has been specially got up by the Company for distribution at the stand. In addition to the ordinary catalogue material, there is matter of an instructive and interesting character; and the illustration work has been executed in high-class style.

The Davis Gas-Stove Company, Limited.

(Stands Nos. 36, 118, and 143.)

With perfect confidence, it may be said that the Davis Gas-Stove Company, Limited, have on this occasion surpassed anything that they have previously done in the way of a public exhibition of their manufactures. Part of the exhibits are in the Ducal Hall and part in the Queen's Palace. Before noticing the salient features, we may state that at the Ducal Hall stand there are: A complete set of the celebrated "Diamond" and "Metropolitan" gas-cookers, summer-and-winter stoves, grillers, general foundry work of the best class, a large selection of gas-fires, a popular feature of which is the well-known "Trident" burner fire, and radiators and coils. At the Queen's Palace stands are large gas-roasters, "Metropolitan" kitcheners, large gas hot-plates, automatic hot-plates, a range of double ovens with automatic hot-plate, gas hot closet and carving-table, with covers and balance-weights, "Ajax" circulating boilers, a new and improved ham boiler, "Ajax" steam-boiler, steam hot closet and carving-table, lagged steam-jacketed pan, lagged steam beef-tea extractor, lagged steam cooking chests, with wheel-screw doors, coffee-roasters, and baking ovens.

Inspecting a few of the prominent exhibits, the 36R restaurant roaster has several good points. It is a roaster suitable for the very largest catering establishments, with an outside measurement of 7 ft. by 3 ft. 8 in. by 2 ft. 10 in., and an oven capacity of 66 in. by 40 in. by 30 in. The oven is capable of cooking 500 lbs. of meat at a time, at, we are told, quite a nominal cost for gas consumed. It is enamelled throughout internally, and has loose hanging side-runners and self-supporting grid-shelves. It is highly finished externally, with mahogany lagging and brass mounts. Next to be noticed is a set of ranges similarly fitted in all respects, but of varying capacities, made suitable for large or small establishments by being simply joined together or separated according to requirements. A large double steam chest, mahogany lagged and brass mounted, and fitted with the Company's patent locking arrangement, is a fine piece of work. In view of accidents which may at any time happen when steam chests are used and operated by careless or ignorant people, it is, of course, desirable, as far as possible, to minimize the risk attendant upon their use; and this is stated to be perfectly effected by this automatic arrangement. The moment the steam is turned on, the lever opening the valve to admit it automatically bolts the doors, already closed by the handles; and the doors cannot again be opened until the entering steam is shut off. Simultaneously with the shutting off of the steam, the exhaust is opened, and the locking-bolt withdrawn. With such an automatic arrangement accidents must be impossible. Regarding the beef-tea extractor, this is lagged and mounted similarly to the foregoing, is heated by steam, and fitted with a loose aluminium pan and covers, for the extract, on the most up-to-date principle.

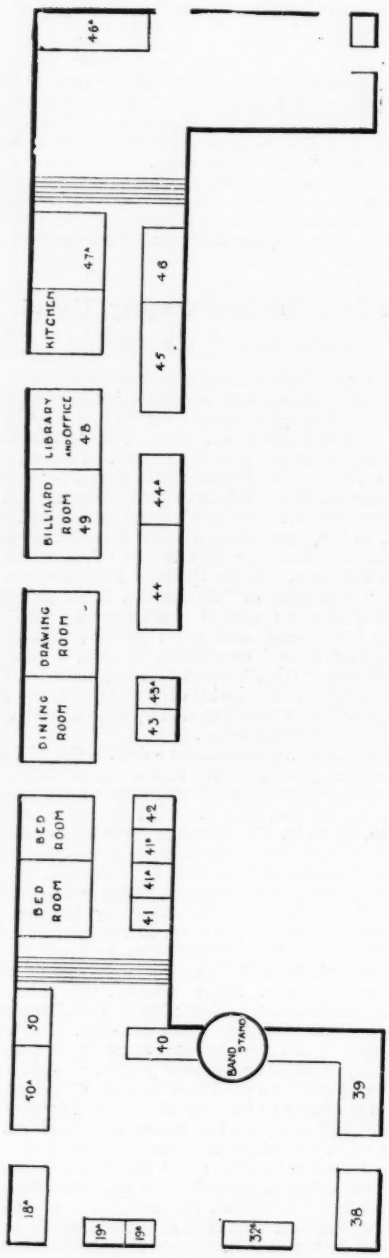
Stewarts and Lloyds, Limited.

(Entrance Hall.)

The exhibits of this well-known firm occupy the whole of the right-hand side of the entrance hall leading into the Ducal Hall. The first object to attract the eye of the visitor is three groups of pipes (red, black, and grey), of varying lengths, arranged organ-pipe fashion, having in front of them a stand crowded with tees, bends, joints, &c. Farther on, there are more striking examples of the Company's productions—an 18-inch lap steel gas-main, with their pressed socket-ends; a 36-inch lap steel condenser pipe, and one of 24 inches, as supplied for the Provan Gas-Works, Glasgow; an 18-inch pipe furnished with the Mephan-Ferguson lock-bar, described in the "JOURNAL" for the 25th ult. (p. 264); and another of 9 inches in diameter, as supplied to the Mond Gas Company; and a 21-inch welded gas reservoir. The exhibits include samples of the "Kimberley" socket joint, the "Albion" joint (with turned-up ends), cast and wrought iron flanges of various kinds, and fittings for gas and other purposes. The Company's illuminated title affords a unique example of skilful bending of ordinary welded tube. Altogether, they make an excellent show.

IN THE QUEEN'S PALACE ANNEXE.

(General Exhibits.)



PLAN OF STANDS.

John Barker and Co., Limited.

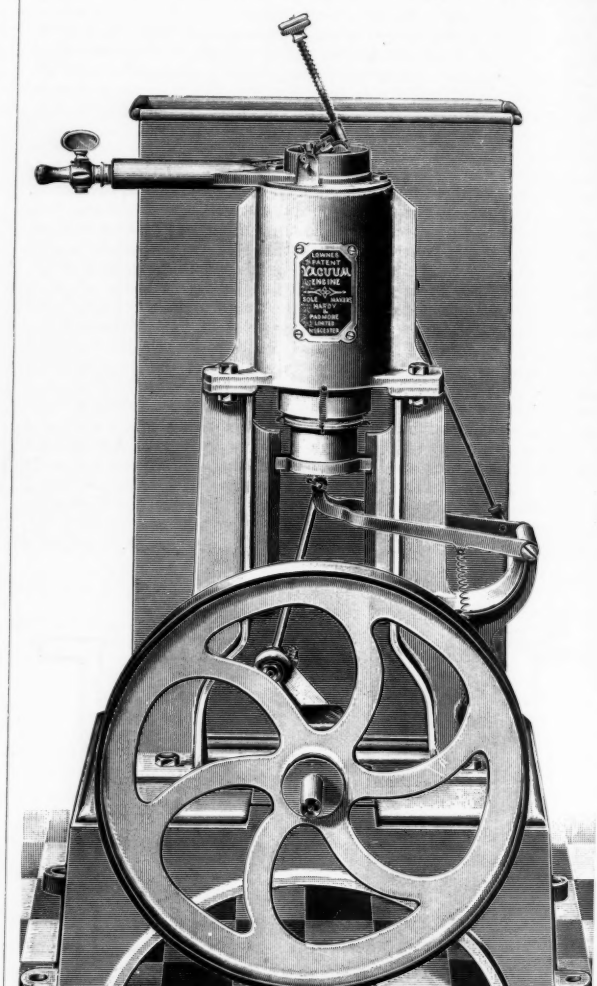
(Stand No. 19B.)

At this stall are shown a number of examples of the work which Kennedy's patent pipe-bending machine is capable of doing. It will be seen that it can bend gas or steam tube, electric conduits, brass or copper pipes, as well as angle or T iron, into an endless variety of shapes.

Messrs. Hardy and Padmore.

(Stand No. 19A.)

To this stand, which has been specially designed to attractively exhibit the engines, the gas engineer will be drawn. It will be found that the exhibit consists of some five sizes of the "Lowne" atmospheric engines, fitted some to work with gas and some with petroleum, and driving a pump, fan, &c.; and of one small ½-horse power "Ideal" gas-engine, and one ¾-horse "Ideal" oil-engine. The "Lowne" engines are practically a complete novelty to the public; but the "Ideal" engines have been well-known for many years. To the Lowne motors, which are very neat and simple arrangements, and suitable for small work, attention will be principally given. The illustration will give an idea of its build; and, as to its action, it is described by the makers as follows: For about the first half its outstroke, the piston draws flame into the cylinder through a suitable valve. This valve then closes; and, by the time the piston has completed its outstroke, the flame has burnt out—thus creating a substantial vacuum in the cylinder. The pressure of the atmosphere then acts on the piston, forcing it into the cylinder, and each in-stroke develops considerable power. The valve then opens again, and the cycle is repeated many hundred times in a minute. Last September, the "Engineer" published a description of the engine, and concluded



THE "LOWNE" VACUUM ENGINE.

it with a short account of a test specially made with a 2-inch cylinder engine. It was found that the consumption of London gas was at the rate of about 100 cubic feet per brake horse power; the actual power being, at 480 revolutions per minute, nearly $\frac{1}{10}$-horse power. But some difficulty was experienced in maintaining this speed; and at 400 revolutions (at which the engine will run for a long period) the horse power was about 0·076. It is understood that, in later engines, the difficulty of maintaining the higher speed has been overcome. "It should perhaps be said," remarks our contemporary, "that, as it is not easy to take accurate tests of these small powers, the results are to be regarded as only approximate."

Witt's Patent "Underlight" Burner.

(Stand No. 43.)

Messrs. Nehemias, Lee, and Co. are the sole agents in this country for what is known as the Witt patent "Underlight" burner. An inspection of their stand will show that here is a novelty in the ordinary vertical incandescent burner, and that it is one—whatever may be the cause—which gives a remarkably good

illumination. To use their own words—not our own—the burner "is so constructed as to combine the advantages of the ordinary incandescent gas-burner with those of the inverted incandescent gas-burners, while it absolutely avoids the disadvantages of both." Hitherto the incandescent mantle used to hang quite close round the burner; in the Witt burner a space is left between the burner and the mantle, and a special holder is provided to keep the mantle in its right position. The flame does not play on the top of the burner, but streams through the holes at the sides against the mantle, and is drawn up by the draught. Now it is quite evident, the exhibitors point out, that the light of the inner side of the mantle, which is cast downwards, is absolutely lost in all other burners, because they do not permit the light to pass; and this applies—though in the reverse direction—to the inverted burners. The Witt burner lets the light flow down through the space between the burner and the mantle; and at the same time the side and top light is said to be equal to that of any other system. The importance of this circumstance is shown by the following table. The tests were made with an equal consumption of gas of 120 litres (4·23 cubic feet) per hour and at a pressure of 33 mm. (13-10ths) for all burners.

Table of Photometrical Measurements.

	Witt Burner.	Auer Original.	System Auer. One Sieve.	System Auer. Two Sieves.
Vertical ⊥	28·55 H.K.	0·49 H.K.	0·40 H.K.	0·38 H.K.
Angle of 10° . . .	36·33 ,,	6·04 ,,	4·46 ,,	3·90 ,,
,, ,, 25° . . .	60·54 ,,	26·14 ,,	19·96 ,,	16·15 ,,
Horizontal ⊣ . . .	101·40 ,,	96·07 ,,	73·64 ,,	59·85 ,,

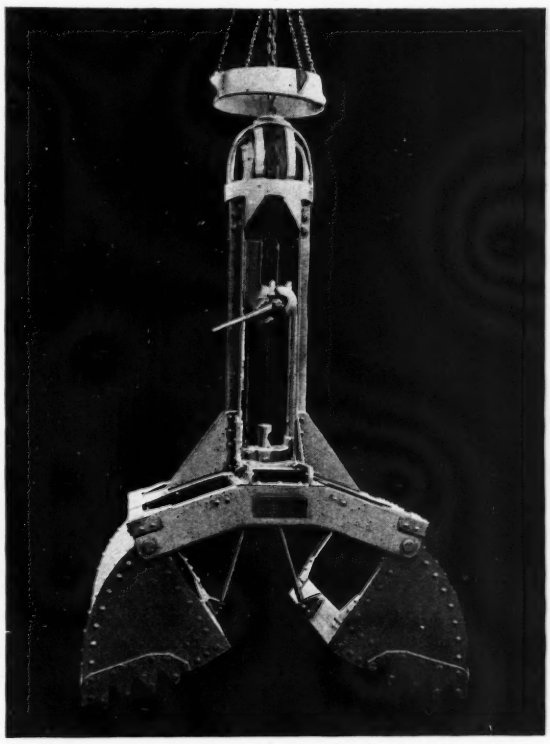
The illuminating power is calculated upon "Hefner-Kerzen." It results from this statement that the "Witt burner" is decidedly superior to all other systems. One English candle power is equal to 1·14 H.K. (German Hefner-Kerzen). (Signed) Dr. CARL MEYER Dr. C. ENOCH, Chemists of the Board of Commerce.

The results given by the above measurements show that the Witt burner produces at an angle of 10° a light more than six times, and at an angle of 25° a light more than two-and-a-half times, as great as the original Welsbach burner. "For practical purposes, the light is generally wanted at angles of 10° to 25°; and therefore from this point of view the light of the Witt burner is three to four times greater than that of any other system." With the Witt burner the light is spread at the sides on the ceiling and downwards, and there is no shadow. The stand is situated on the bridge connecting the Ducal Hall with the Queen's Palace and opposite the suites of furnished rooms. It is so fixed as to show the difference between the light given by the Kern burner, the ordinary Welsbach burner, and the Witt patent burner.

The Thames Iron-Works, Shipbuilding, and Engineering Company, Limited.

(Stand No. 32B.)

Labour-saving appliances in the shape of Hone's patent grabs are exhibited at this stand by the Thames Iron-Works, Shipbuilding, and Engineering Company, Limited. The exhibit comprises three working models showing respectively: (*a*) A tooth grab, operated by an ordinary single-chain crane, unloading coal from a barge and discharging into a hopper, illustrating the method suitable for gas-works; (*b*) a spoon tine grab mounted on a similar crane as used for dealing with dense materials and for general purposes; and (*c*) a four-bladed excavator for well and cylinder sinking and similar purposes. A Hone grab of the tooth type (No. 4 size), and with a capacity of about 14 cwt. of coal, is also shown. This machine is exhibited as an example of the most suitable type for dealing with coal and other materials used in gas-works, and is constructed in sizes varying from 6 to 35 cwt., and in capacity to suit the crane power available. There is also an example of Hone's patent single chain grab, which is used very extensively for handling material in bulk—such as coal, coke, ballast, sand, grain, chalk, &c., and also for dredging purposes. The great advantages of this type are the complete adaptability of the appliance, and the economy with which it performs its work. The grab can be fitted to any ordinary single-chain crane, whether worked by electricity, steam, or hydraulic power. No balancing arrangement or alteration is required on the crane; it only being necessary to take off the hook at the end of the lifting chain, and reeve the chain through the sheave block in the grab. The advantage of Hone's patent grabs in this respect is obvious, particularly where it is desired to apply them to wharf or other cranes which have been in use previously with skips or buckets. For wharf purposes, where miscellaneous cargoes are landed, the grab can be detached from the crane in a few moments, after discharging coal, and the cranes left at liberty for other work. Interchangeable blades of different types can also be supplied to the same grab for use in various classes of bulk material. Of course, the cost of discharge of various materials with this grab varies slightly according to local conditions; but the average net cost for coal, it may be stated, approximates to one penny per ton, including labour and crane charges. With reference to the grab and excavator exhibit, one of the special features of this plant is the elimination of suction in stiff excavation work, and another, the great gathering power of the grab compared to its cubic capacity when closed. Both these advantages are obtained by pivoting the blades at the extreme and opposite ends of a girder frame (and not together on the same pivot in the centre of the machine, as in the older types of double-chain grabs), thus



HONE'S PATENT GRAB.

causing the blades to cut in a segment of a circle eccentric to their centres, and giving a very great space between the jaws when the grab is open. The stand has been specially prepared, with models of cranes, grabs, wharf, and barge to illustrate some of the conditions under which the grabs would be worked.

The Gaslight and Coke Company.

(Stand No. 39.)

The Gaslight and Coke Company's exhibits (which are catalogued as No. 39, and are situated just beyond the Ducal Hall, close to the bandstand) occupy a space of about 400 square feet. There is popular interest attaching to them; and they are bound to be well patronized. In the first place, there is a kitchen and parlour, fitted up with a prepayment meter, cooking-stove, and fittings, such as the Company are prepared to supply to consumers of the artizan class. This exhibit is entitled "The Working Man's Gas Supply." The rooms shown are comfortably, but suitably, furnished. In the kitchen is to be seen the cooking-stove, which is of the standard pattern adopted by the Company, and has a commodious (14-inch) oven, two boiling-burners, and a griller. There are also exhibited samples of the boiling-rings and grilling-stoves which the Company supply in cases where there is no space available for a cooking-range. The meter, which is made with glass sides to show the internal structure and working, is also fixed in the kitchen; and this room is effectively lighted by a single-light pendant with incandescent burner. The parlour is fitted with a small gas-fire, such as the Company are willing to let out at a nominal rent to consumers who wish to have this means of heating their rooms, and is lighted by a harp pendant, with incandescent burner and opal shade. Two brackets are also fitted over the mantelpiece, to show the kind of fitting which is supplied generally for bedroom lighting or in living-rooms, where it is desired to light from the walls. It may be of interest to incidentally mention that the Company have over 180,000 customers supplied on the "penny-in-the-slot" system, and somewhere about 100 million pennies are collected from these meters annually.

Next comes a shop, in the window of which are displayed samples of the multifarious products obtained from tar, ammoniacal liquor, and cyanogen liquor at the Company's chemical works at Beckton. These samples are arranged on tiers of shelves, in three groups, according to the first product—tar, ammoniacal liquor, or cyanogen liquor—from which they are obtained. A full list of the samples, showing the principal commercial purposes to which they are put, is given in the official catalogue. The lighting of this shop window is also in the nature of an ex-

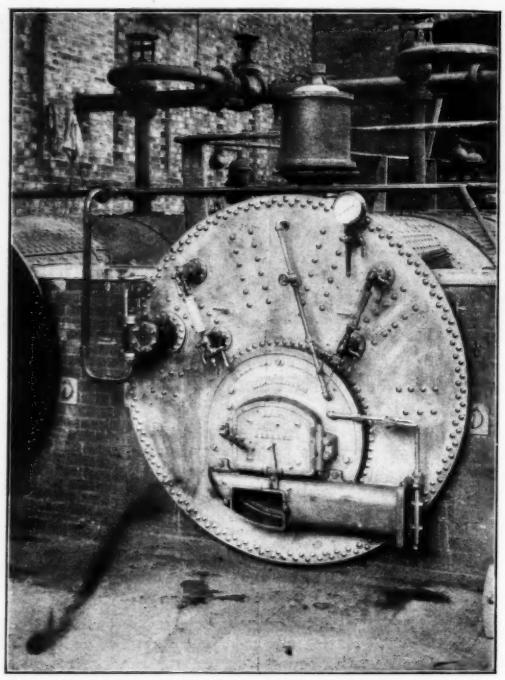
hibit, and is carried out entirely on the "hidden light" principle; most of the burners being placed above the window case, and fitted with reflectors throwing the light into the window, while some are placed as footlights, hidden by shell reflectors. The interior of the shop is being used by the Company as an office for the meeting of officers and consumers, and for the answering of inquiries, taking orders, and so forth.

In addition to these exhibits, the Company are responsible for the lighting, heating, and cooking arrangements shown in a suite of rooms fitted up by Messrs. J. A. Fallows and Co., as a model flat, on the bridge between the Ducal Hall and the Queen's Palace. This flat shows how coal may be entirely dispensed with —to the saving of labour, trouble, dirt, and smoke. The Company have provided the beautiful illumination device outside the main entrance to the Exhibition, which they made and fixed at their own expense. The Company have done well, and, as seen, have furnished the exhibition with features as attractive as any.

Messrs. Meldrum Bros.

(Stand No. 40.)

Near to the band stand, Messrs. Meldrum Bros. are exhibiting their well-known specialities, comprising: (1) Meldrum's standard patent breeze-furnace. (2) Meldrum's patent improved low-grate



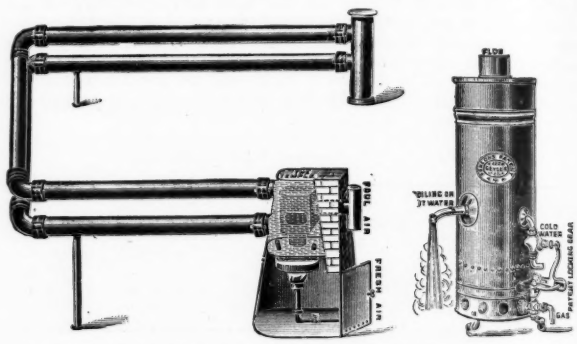
MELDRUM'S PATENT FURNACE.

furnace. [We are informed that there are now more than 13,000 of these furnaces in use.] (3) Meldrum's patent retort-scurfer. These specialities are in use in over 300 gas-works; and, therefore, it is not too much to say that every gas manager in the world is familiar with them, and with their efficiency producing qualities.

Messrs. Fenlon and Son.

(Stand No. 41.)

There are three main exhibits at the stand of the above firm. The first is the "Tudor" geyser, fitted with either patent locking gear taps, or with patent automatic dual valve. The construction of the geyser is simple. The cold water enters where shown—at the union of the cold-water tap. It then gradually rises round the cone and the heating-box until it reaches the top, where a thin layer of water is maintained. The water falls by natural gravity down a side tube which reaches from the top of the heating-box, and is connected directly into the return tube of the boiler. The water is heated in this boiler, and circulates—flowing out of the flow-tube direct into the spout, and thence away for



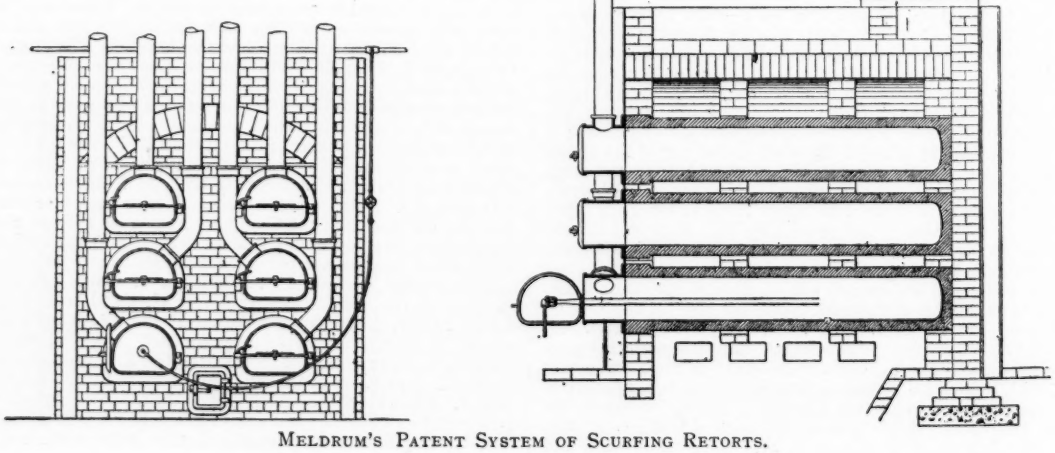
use. Arrangements are made for carrying off the products of combustion. Regarding the patent locking gear tap, this has a long lever arm, at the end of which a plate is arranged with a slot cut in it. The slot slides over the handle of the gas-tap, when it is turned off; thus completely preventing any gas from passing into the geyser. To set the geyser in action, the water-tap lever is released from the handle of the gas-tap; and this causes the water to immediately flow into the bath. The gas is then ignited at the pilot-light; and the handle of the main gas-cock is turned towards the geyser. This action also brings the lighted pilot-light over the top of the series of burners, and ignites them without any escape or explosion.

The "Temple" hot-water apparatus for warming green-houses, conservatories, &c., is worth notice; the firm making quite a speciality of this kind of work with gas as the means of heating. The third exhibit is the "Unique" hot-water self-contained radiator. In this apparatus, a No. 2 Bray burner will, the information is given, raise the temperature of the water to 190° Fahr. in the three-section size, which contains 11 feet of heating surface. An absolutely new feature in the firm's productions is a patent automatic pneumatic dual valve which is used with the geysers, and which will automatically shut off the gas should the water supply fail—thus preventing all accident from burning.

Messrs. A. E. Podmore and Co.

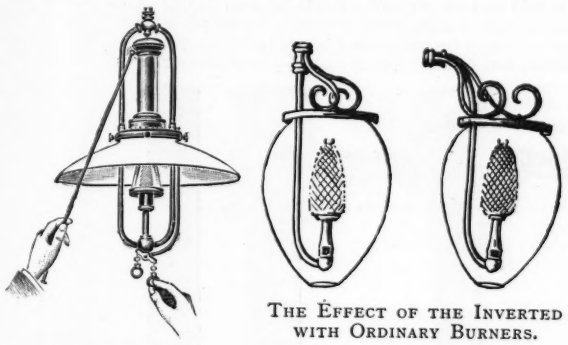
(Stand 41A.)

The several designs of the patent recuperative high-power lamps made by this firm have from time to time been described in the "JOURNAL," and they are well represented on this stand. Attention is first directed to the various patterns and sizes of the interior form of the lamps, with dust and insect proof burners. It will be remarked that the lamps are finished and decorated in colours, suitable for use in the best of rooms, and also for ordinary shop and workshop lighting. In fact, there is no limitation to their applicability for interiors. The system is also shown as applied in the Podmore patent square lanterns for street-columns and



MELDRUM'S PATENT SYSTEM OF SCURFING RETORTS.

suspension, for outside use, and public lighting generally. The exhibits also illustrate how, by Podmore's patent adaption system, all kinds of existing lanterns and lamps can be converted to this special method of high-power lighting. The "Charles" outside lamp for shop window lighting, finished in green enamel, and relieved with gold lines, is one which commends itself to notice on account of its strength, combined with cheapness.



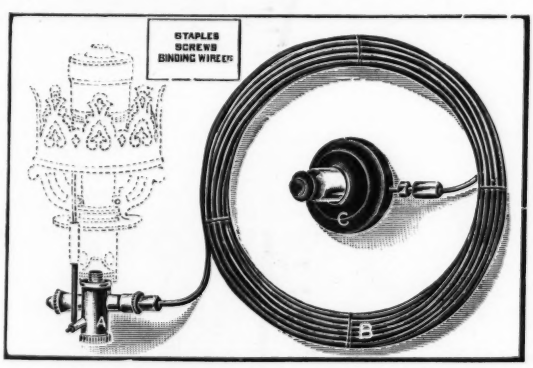
THE EFFECT OF THE INVERTED WITH ORDINARY BURNERS.

These lamps, it is seen, are equally suitable for "C" or high-power burners. Another exhibit is a new burner to fit on horizontal arms for use with "C" mantles, without chimney, but with decorated globe, for private lighting. A new patented form of geared cantilever pendant for inverted burners or ordinary "C" burners, made to close up and extend to 18 inches, merits attention. The "Candle" incandescent gas-lamps will appeal to some as quite a novelty. These are for use with Gem sized mantles, and are fitted with red, green, or old gold silk shades, with beaded fringe, making a pretty combination for drawing-rooms and other situations where a decorative effect is required. Further exhibits are: A single balance pendant light, for lowering and raising by means of an extended arm; porcelain pendants (which can be washed) suitable for business premises, where a clean, white effect is desirable; and a choice selection of the latest patterns of shade lights, pendants, brackets, globes, &c.

The Pneumatic Gas Lighting Company.

(Stand No. 42.)

The convenience of being able to light and extinguish gas-burners from one point at any distance away, as in the case of the electric light, is well recognized. The ability to do this is urged by the electric lighting people as a valuable attribute of their system, not possessed by any other. This is a mistake, as the Pneumatic Gas Lighting Company and others can show, and as is proved at this stand. The simple pneumatic apparatus, as is seen by the illustration, consists merely of a little valvular device



A at the base of the burner, with the necessary fine flexible tubing B to conduct the air pressure, and the pneumatic push or switch C. The regulation of the supply of gas to the bye-pass is controlled by a small screw in the seat of the valve. A consideration is that the apparatus needs no attention whatever beyond the wiping of a brass piston in the lighter A (which can easily be removed by unscrewing the side nuts), once in, say, six months. Several advantages of an economical and convenient order are pointed out. The latter are obvious; the former include a saving in mantles and chimneys, and the prevention of unnecessary waste of gas.

Herr Ernst Hildebrandt.

(Stand No. 43.)

A useful but small exhibit is this one of Herr Hildebrandt. Magnesia rods for the support of incandescent mantles and magnesia rings for the suspension of inverted mantles we must have; and rods and rings must have their good points, or disaster quickly succeeds their entrance into service. The exhibitor claims to be the largest manufacturer in the world of these magnesia rods and rings; and this is a position attained by the "superior quality, especially in respect of strength, and clean finish" of the goods. Samples which we have had confirm the asserted merits.

Messrs. Wallach Bros.

(Stand No. 43A.)

Several of the novel features which are found at the stand of Messrs. Wallach Bros. have from time to time been described and illustrated in the "JOURNAL." There are, for instance, the Pnumapaint painting-machine for painting with compressed air, the Evertrusty "Star" white and lime washing machine, as well as the patent draught indicator for measuring the draught in retorts, boiler-flues, &c., the adoption of all of which in gas-works is testimony as to their usefulness and economizing characteristics. There is likewise to be seen the patent absorbent respirator, which will enable men to enter gas-tanks or rooms filled with poisonous gases without any danger. It is stated that the respirator "will absorb sulphuretted hydrogen, carbonic acid, or chlorine perfectly. The same remarkably perfect absorption is also obtained with mixtures of sulphuretted hydrogen and carbonic acid. A mixture of air with any proportion of sulphuretted hydrogen up to 20 per cent., will not contain as much as one-hundredth of 1 per cent. of sulphuretted hydrogen after being drawn through the respirator, even at so great a speed as 30 cubic feet per hour. The absorption continues until practically the whole of the absorbent has become saturated with the gas." The large sized respirator, when charged with the special absorbent, will, it is declared, keep a man safe in air containing ten times the minimum poisonous quantity of sulphuretted hydrogen for six hours, or in gas of one hundred times the poisonous strength for forty minutes. The small size respirator is one-half the size of the larger size one, and can be carried in an ordinary breast pocket. When charged, it weighs about 14 oz., including the mouthpiece and connecting-tube. It will work for half the time given for the large respirator. The respirator consists of a container, filled with the special absorbent, and connected by a flexible tube to a new form of mouthpiece, fitted with an automatic inlet and outlet valve. The air enters by the opening; and, passing downward through the absorbent, is filtered through cotton wool in the ebonite chamber, and conveyed to the mouthpiece by the flexible tube. The expired air escapes through the exit-valve. A noseclip, for the prevention of accidental inhalation through the nose, is attached to the mouthpiece. Among other exhibits are the "Evertrusty" aluminium respirator; and the "Amabestine" jointing for use in gas-works. For this, it is claimed that it cannot blow out, and will stand any pressure or temperature.

Mr. J. Nutting.

(Stand No. 44A.)

At this stand are shown combined gas-stoves and boilers. The stove is connected with a tank overhead, so that when cooking is going on, water is being heated, much the same as with an ordinary kitchen range with boiler. The stoves are suitable for hotels. There is also shown at this stand a feed-water regulator for steam-boilers.

Messrs. Quirk, Barton, and Co., Limited.

(Stand No. 46.)

This firm make a good show of lead and compo. gas-pipes and solder. There is also upon the stand a bar of pig lead.

The "Vivid" Patent Incandescent Mantle Company.

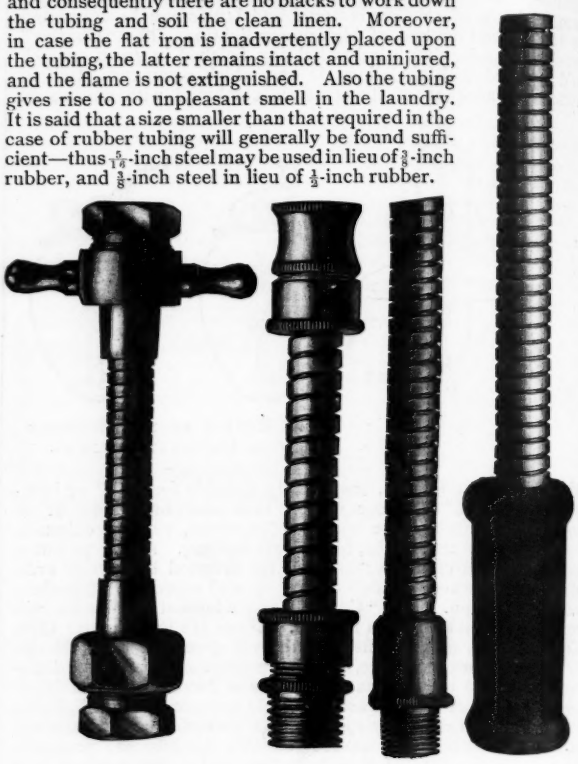
(Stand No. 46B.)

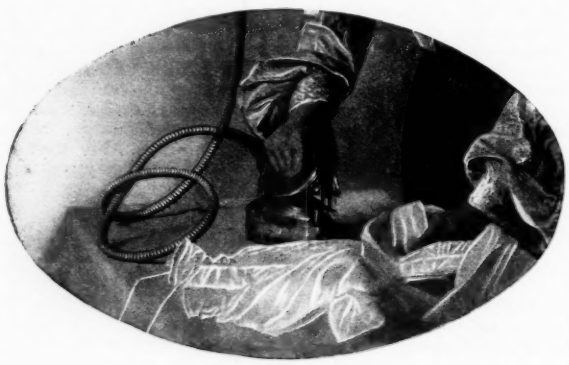
The "Vivid" Company show their patent burner and mantle The Company have, it will be remembered, from their start been steadfast in their opposition to low-priced, worthless mantles—maintaining that only the best mantle can be an aid to the gas engineer. When quality was sacrificed by some in order not to lose profit by supplying at a low price, the "Vivid" Company held out with a high-grade mantle, and not only so, but brought about improvements as experience accrued. They have to-day, as is seen at their stand, a mantle of high quality, and one that is much appreciated by the consumer. The appearance of the mantle alone suggests a good and carefully-made article. The Company's patent burner has points of excellence which will be quickly explained and recognized. It follows, as the Company put it, "the workings of natural laws, with the result that a new and remarkably efficient means has been evolved by which a brilliant, diffusive, and gratifying light is obtained." The burner is adjustable over a wide range of consumption and pressure. It is also distinguished by a pleasing appearance; and what too is an advantage, it consists of only two parts that, for actual practical purpose, come into consideration.

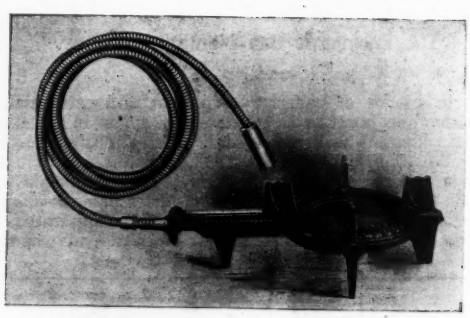
United Flexible Metallic Tubing Company, Limited.

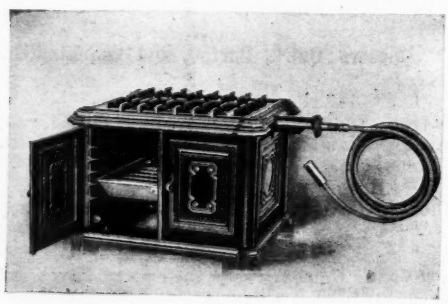
(Stand No. 45.)

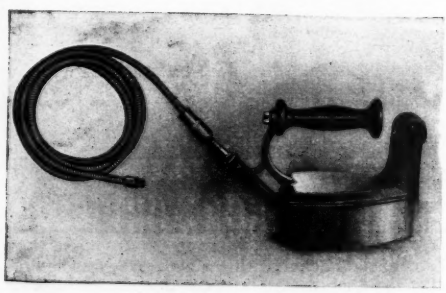
At this stand, the United Flexible Metallic Tubing Company, Limited, are showing numerous samples of their goods. Metallic tubing is now taking an important part in the production of the ornate and serviceable suspension, draw-down lamps and fittings which are used for incandescent gas lighting; and therefore some interest is taken in this exhibit. It is learnt from the makers that their invention furnishes manufacturers with a reliable and practically indestructible substitute for rubber hose, capable of carrying steam at all pressures, even in special cases up to 300 lbs. per square inch. It can also be used with advantage for oils, gas, compressed air, and hydraulic purposes; and it is adapted for junction-pipes and for engineering work of every description. The tubing is said to be unaffected by heat or cold, and remains flexible at all temperatures. Moreover, it does not kink or crush; and thus it always delivers to its full capacity. Owing to recent improvements introduced into the manufacture, it has become possible to supply pipes up to 8 inches in diameter. The uses of this tubing are so numerous and varied that it is impossible here to do more than indicate a few of the purposes to which it has been successfully applied. Many thousand feet are in use in the Liverpool Docks, for conveying steam to the grain elevators; and the Marine Salvage Company, of Liverpool, and several other Salvage Companies, have, it is said, introduced the tubing with excellent results. Nearly all the great railway companies have adopted the tubing for (among other purposes) carriage heating, conveying steam from stationary boilers, driving portable drills, supplying compressed oil gas to carriages, &c. The tubing is employed by many gas companies and gas users throughout the world; and the fact that it is not inflammable has attracted the favourable notice of insurance companies. The strength of the tubing (which has been found to be uninjured after cart wheels have passed over it) points to its use for temporary purposes by contractors, builders, and others; and in the case of fires in theatres it has remained capable of supplying gas after being exposed to the action of the flames. For employment with gas-irons, the tubing will be found cleaner, as well as far safer, than rubber. No charring takes place in the interior, and consequently there are no blacks to work down the tubing and soil the clean linen. Moreover, in case the flat iron is inadvertently placed upon the tubing, the latter remains intact and uninjured, and the flame is not extinguished. Also the tubing gives rise to no unpleasant smell in the laundry. It is said that a size smaller than that required in the case of rubber tubing will generally be found sufficient—thus $\frac{5}{16}$-inch steel may be used in lieu of $\frac{3}{8}$-inch rubber, and $\frac{3}{8}$-inch steel in lieu of $\frac{1}{2}$-inch rubber.











Messrs. R. Laidlaw and Son, Limited.

(Stand No. 46c.)

The gas engineer will be tempted to stay at this stand, where will be seen several imposing exhibits of Messrs. R. Laidlaw and Son's manufactures. A prominent feature is an exhauster, capable of passing 250,000 cubic feet of gas per hour, at a speed of 80 revolutions per minute. This exhauster is part of a contract on hand for the Valby Gas-Works at Copenhagen—consisting of three exhausters, with disc valves, and horizontal high-pressure steam-engines, with variable cut-off expansion gear, for a working pressure of 130 lbs. per square inch. The further exhibits are two 17-inch disc valves, for the inlet and outlet branches of the above; five double-faced wedge sluice valves for gas-mains, &c., (12, 8, 6, 4, and 2 inches diameter); three internal rack gas-valves, suitable for 6, 4, and 3 inch connections; three prepayment gas-meters (one each for 2, 3, and 5 lights); a dry meter, with glass window portions, to show the interior working parts and slide-valve movements; a wet meter also constructed with window portions, in order to show the internal arrangements; a group of dry gas-meters, of capacities ranging from 2 lights up to 200 lights; six street-lamps for incandescent gas lighting; a gas-pressure register; a test-holder; a King's pressure-gauge; two cases showing various pressure-gauges for gas; an assortment of gas cocks and fittings; a number of framed photographs illustrating some of the work recently carried out by the firm; a group of half sections of faucet joints, representing the standard dimensions of spigot and faucet pipes from $1\frac{1}{2}$ inches up to 24 inches diameter; a group of T-pieces or right-angle branch pipes in half-sections, showing the standard dimensions of these for ordinary spigot and faucet pipes from 2 inches to 12 inches diameter; a group of standard quarter bends in half sections, showing the

standard dimensions of these for connecting up with ordinary spigot and faucet pipes from 2 inches to 12 inches diameter; a thimble casting in half-section, showing two spigot ends jointed up with lead and yarn; and a 12-inch diameter ball and socket joint in half-section, specially designed for conveying gas or water where the ground is undulating—such as when a pipe-line stretches across the bed of a river.

Extending the foregoing notes, it may be mentioned that the exhauster referred to is of the firm's latest patented three-bladed type, one important feature of which is that the interior of the revolving barrel is utilized to increase the pumping capacity without the introduction of a single additional working part to that in any other exhauster of the rotary three-bladed type. The pumping action involved by the three blades operating alternately in the inner space of the working barrel and the usual outer chamber of the exhauster is stated to be equivalent to the combined effects of two three-bladed rotary exhausters; the one working within the other, and so arranged relative to each other that not only is the capacity of the exhauster thereby increased from 20 to 45 per cent. (according to dimensions), but also the fluctuations or oscillations in the gas pressure, common to all rotary exhausters, are, by the special arrangements and design of this exhauster, reduced to the minimum. In the comparatively small space at their disposal, the firm give some idea of the extensive character and of the varied kinds of apparatus and specialities designed and manufactured by them; and it will be understood that all the apparatus exhibited has been made by them of all capacities from the smallest to that of the largest required in any process of gas manufacture.

Among the photographs hung on the walls of the stand, are included the following: Two station meters of special design, erected by Messrs. Laidlaw and Son at the Granton Gas-Works, Edinburgh, each capable of passing 200,000 cubic feet of gas per hour. Two large exhausters, each capable of passing 750,000 cubic feet of gas per hour, at a speed of 60 revolutions per minute, driven by two gas-engines through specially designed frictional gearing, so that either engine may be utilized to drive either exhauster separately, or both engines and exhausters combined. This exhausting plant was erected by them at the pumping station of the Granton Gas-Works. One of four sets of two exhausters, with horizontal tandem steam-engine, with a total capacity of 1,200,000 cubic feet of gas per hour, at 80 revolutions per minute, erected at the Nechells Gas-Works of the Birmingham Corporation. Three sets of vertical steam-engine and exhausters, having a total capacity of 210,000 cubic feet of gas per hour, erected at the Hillsea Gas-Works of the Portsea Island Gas Company. From the illustrations referred to, and the examples of apparatus exhibited, it will be seen that all the apparatus and gas plant are of the latest designs.

Messrs. P. Simon and Co.

(Stand No. 46A.)

Messrs. P. Simon and Co. are exhibiting, for the purpose of demonstrating to all whom it may concern, that "electricity can be generated by gas-engine and dynamo plants at about 30 per cent. less than the cost of current purchased from the supply companies." They show in connection with this demonstration a 20 brake horse power Capel "X L" gas-engine, driving a dynamo by Messrs. Johnson and Phillips, of Charlton; a 5 brake horse power Capel "X L" gas-engine, driving a dynamo by the same firm; and a 5 brake horse power motor, driving a two-throw pump made by themselves.

From a circular which the firm are distributing, we extract the following table, showing the approximate cost of electric current at per unit by installing gas-engine and dynamo plant. The figures include the cost of gas, 5 per cent. interest on the cost of plant, 10 per cent. depreciation, and necessary oil, waste, &c., and are based on a plant equal to 200 16-candle power lamps, working four hours per day (average), and 300 working days per annum.

	Pence per Unit.
Bournemouth Gas Company	2·01
Chatham and Rochester Gas Company	2·2
Commercial Gas Company	2·68
Croydon Gas Company	2·15
Gaslight and Coke Company	2·18
Ilford Gas Company	2·2
Ipswich Gas Company	1·98
Lea Bridge Gas Company	3 2
North Middlesex Gas Company	3 3
Norwich—British Gaslight Company.	2·5
Reading Gas Company	2·3
Richmond Gas Company	2·3
Southampton Gas Company	2·8
South Metropolitan Gas Company	1·41
South Suburban Gas Company	2·05
Tottenham and Edmonton Gas Company	2·2
Wandsworth and Putney Gas Company	2·09
West Ham Gas Company	2·2
Winchester Gas Company	3·3

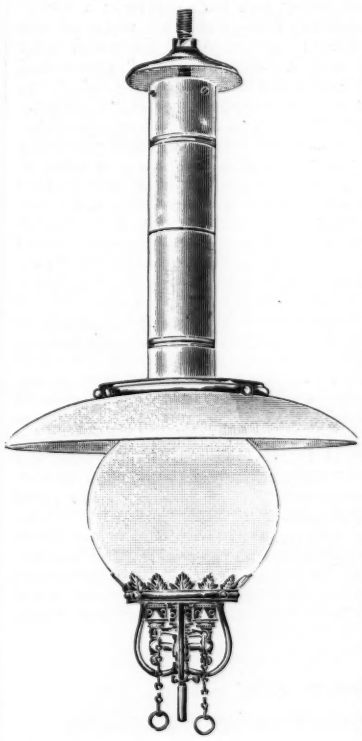
Larger plants and those running longer hours would "work out at a considerable less cost per unit—even as low as 60 per cent. less than the above figures."

Messrs. J. & W. B. Smith.

(Stand No. 47.)

Passing out from the Ducal Hall into the annexe, the first thing that catches the eye is the very effective lighting of the band-stand, with one of the latest patterns in inverted lamps—the "Brightray," introduced by the above-named firm, and which, at ordinary pressure and a consumption of 10 to 12 cubic feet of

Two of Messrs. Smith's Specialities.



gas per hour, is said to give a perfectly shadowless light of between 200 to 250 candle power. Any way, this effective installation is a matter for sincere congratulation.

Upon proceeding through the annexe—on the left-hand side, just prior to entering the Queen's Palace—Messrs. Smith have erected a very artistic stand, where all the latest designs in arc lamps, pendants, and brackets, both for ordinary and for inverted incandescent gas-lighting, and suitable for slot-meter work, together with numerous new designs in globes and silk shades, can be seen. A special feature of the stand is the effective lighting here, also, by their "Brightray" lamps, with their special brand of "Glasmi" mantles. These mantles (made in sizes to suit all burners both for high and low pressure lighting) can not only be seen in their finished state, but in their various stages of manufacture from the Ramie plant upwards until ready for use. Another special article we noticed was a pneumatic lighter, which permits the lighting and extinguishing of incandescent burners from a distance by the simple means of a push-button—similar to the switch used in electric lighting. The "Humphrey" lamp in both styles—for interior and for outdoor lighting—is also shown. It should certainly attract the attention of all who require high candle power under low pressure and a small consumption of gas. The lighting of the band stand and Messrs. Smith's general exhibit cannot fail to interest, not only those connected with the gas industry, but all users of gas.

Crown Lamp Works.

(Stand No. 40A.)

The "Briton" and "Rennie" gas arc lamps, constructed under Colbran's patents, are giving a good account of themselves here. They are being exhibited in several sizes. The lamps are designed on scientific principles, are strongly made, and pains, it is evident, are not spared in putting into them good workmanship. A sample is also on view of the Company's anti-vibration joint. The exhibit includes a variety of other types of lamp suitable for general lighting, for hotels, restaurants, shops, &c. One feature of the street-lamps seen is that no putty is required, but the panes slide into bars of special design.

The Shannon Office Labour-Saving Devices.

(Stand No. 48.)

Every gas undertaking has its one or more offices—generally the latter—and therefore the question of saving labour in them by the adoption of conveniences which tend to order, and order to dispatch of business, is one of no small importance. On this account alone, the exhibit of Shannon Limited should be inspected. It is fitted as a library and general office; and there is quite a series of novelties on view—the Shannon system of filing and the "Rapid" roller copier perhaps being the foremost.

Messrs. Cox and Yeman, Limited.

(Stand No. 49.)

Even gas engineers will cast more than a furtive glance at the stand of Messrs. Cox and Yeman. There the firm are showing a dining table, finished in Jacobean oak, with a combined billiard-dining table *en suite*. This is lighted by a chandelier, fitted with inverted incandescent gas-burners.

Messrs. Ewart and Son, Limited.

(Stand No. 50.)

The public will be interested in this stand, in view of its domestic attractions. Here are seen Ewart's patent "B" pattern "Califont," providing domestic hot water service (gas-heated) to spray bath and lavatory; the "Lightning" geyser, providing hot water for a bath in five minutes; a porcelain lined spray bath, with combined fittings for shower, spray, and bath services; a porcelain lavatory stand, with combined fittings and hot-water service from the "B" pattern "Califont;" nickel-plated bathroom toilet fittings and toilet mirror; and Ewart's "Euston" gas-heated radiator. The stand represents a modern up-to-date bathroom, with an efficient hot-water service supplied by the "Califont." This is a piece of apparatus which may be fixed in any out-of-the-way corner in the house (as it is easily fitted), and will provide a hot-water supply to any tap in any part of the house desired, as well as in the bathroom. To sum up the merits of this heater: Through its agency, at a purely nominal cost, a reliable hot-water supply is available at any hour of the night or day, in unlimited quantities and at any temperature. The entire automatic control of the heater prevents risk of accident, effects economy, and provides for any emergency in which hot water is wanted. The automatic control shuts down the gas directly the hot water draw-off tap is closed; the gas only burning while hot water is running to one or other of the taps. Where supplies of hot water are needed to the bath only, the "Lightning" geyser is still to the fore; and with a medium size machine, a hot bath may be obtained at any time in five minutes. The firm suggest that for gas companies in particular who are desirous of increasing gas consumption, serious attention should be paid to the promotion of water heating for domestic uses by gas. It is found that for this purpose gas is cheaper than coal, as well as cleaner, and far more convenient. It is very necessary for gas companies to emphasize the point that the consumer requires an assured service of hot water. There has been on the part of the firm a good experience, where this is guaranteed by gas-heating appliances, of gas-cookers and heating-stoves following afterwards. In these cases, it is more likely than not that the old method of a coal-heated kitchen boiler would have been adhered to, because it was thought impossible to obtain a good hot-water supply by other means.

Messrs. Siemens Bros. and Co.

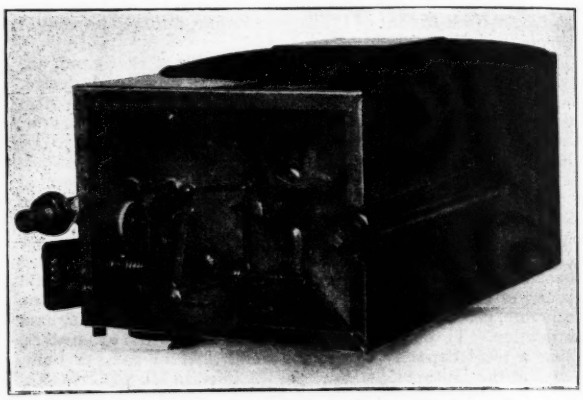
(Stand No. 50A.)

There is a good show at this stand of the electrical and water pyrometers made by the firm. The former is a platinum resistance thermometer which has a coil of platinum wire wound upon a cylinder of refractory material, and usually fixed at the end of a long closed iron tube, where it is protected by a platinum shield. A special kind of pyrometer, suitable for use in a lead bath, has a long sleeve to protect it at its line of contact with the surface of the molten metal. It is claimed for this pyrometer that its determinations can be relied upon to agree within a fraction of 1 per cent. with those of the air thermometer. It finds special application in works where it is necessary to ascertain from time to time the heat of furnaces, flues, &c., particularly those in which the processes demand the maintenance of a definite temperature during certain operations. The water pyrometer consists of a cylindrical copper vessel provided with a handle, and containing a second smaller one with double walls. An air space separating the two vessels, and a layer of felt between the two walls of the inner one, retard the passage of heat through them. The capacity of the inner vessel is a little more than a pint. A mercury thermometer is fixed close to the wall of the inner vessel; its lower part being protected by a perforated brass tube, while the upper portion projects above the vessel, and is divided as usual on the stem into degrees Fahrenheit or Centigrade as desired. At the side of the thermometer there is a small brass sliding scale, graduated for the high temperatures in the same degrees (Fahr. or C.) as the mercury thermometer; and on a level with the zero division of the brass scale a small pointer is fixed.

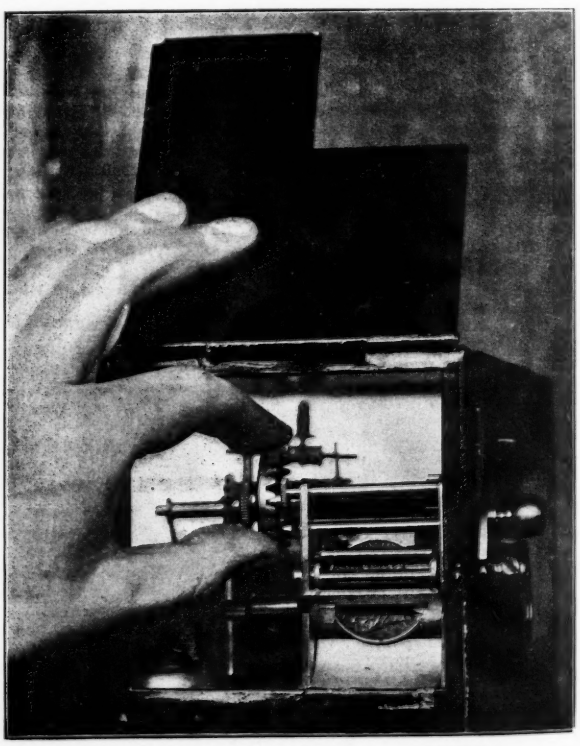
Metropolitan Gas-Meters, Limited.

(Stand No. 50D.)

This Company have confined their exhibit to examples of three forms of their meters—ordinary, stop, and prepayment—all of which have distinctive features. About the ordinary meters we need say nothing, beyond calling attention to their faultless construction. In regard to the stop meter, this is known as the



CONVERTIBLE STOP-ACTION METER.



THE "SIMPLEX" PREPAYMENT SLOT-METER.

"Convertible;" the name being derived from the convertible stop action. This is so arranged that, by opening a spring door, a shaft can be withdrawn disconnecting the movement. This

shaft enables the meter to be set to give the required number of feet of gas to be sold, and the closing of the door connects the movement again. By removing the knob at the end of the shaft, the meter is converted into an ordinary one. The "The" prepayment meter has been long before the gas industry; but there is one form to particularly notice, called the "Simplex," which has a very small and compact mechanism. By detaching the money-box and raising a flap, one can see and get at the entire movement, and this enables the change of the crown wheel to be effected in a few seconds *in situ*.

The Consolidated Pneumatic Tool Company, Limited.

(Stand No. 38.)

The large part which pneumatic appliances and tools now take in the economic and expeditious production of engineering plant of all kinds has increased the general interest of engineers in them. Such plant and tools are, in fact, valuable and now indispensable in engineering construction. Here we have an exhibit consisting entirely of pneumatic appliances, by a Company who, it is seen, manufacture the plants complete from the air compressors and receivers, through the various accessories. They are specially exhibiting pneumatic hammers, riveters, and drills; but what is displayed far from exhausts the extensive range of their productions. In plant and appliances, the variety is so great, and the uses so many, that we cannot do better than recommend a visit to the stand, inspect what is there seen, and advise the visitor to possess himself of copies of the interesting descriptive and illustrated catalogues which the Company have gone to considerable trouble and expense in preparing.

IN THE QUEEN'S PALACE.

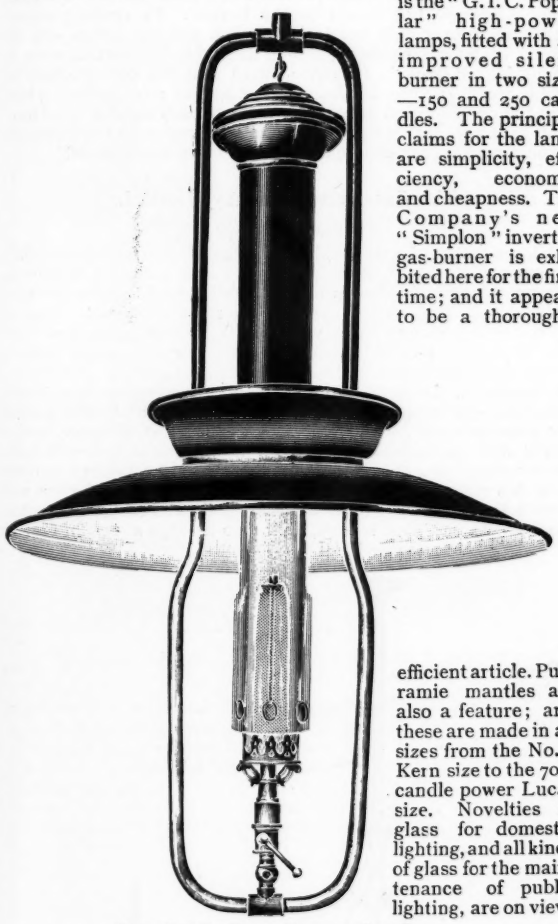
(General Exhibits.)

(*For Plan of Stands see p.* 574 and 575.)

The General Incandescent Company, Limited.

(Stand No. 52.)

In a corner position in the lighting section is the stand of the General Incandescent Company, Limited. A prominent exhibit is the "G.I.C. Popular" high-power lamps, fitted with an improved silent burner in two sizes—150 and 250 candles. The principal claims for the lamp are simplicity, efficiency, economy, and cheapness. The Company's new "Simplon" inverted gas-burner is exhibited here for the first time; and it appears to be a thoroughly efficient article. Pure ramie mantles are also a feature; and these are made in all sizes from the No. 2 Kern size to the 700-candle power Lucas size. Novelties in glass for domestic lighting, and all kinds of glass for the maintenance of public lighting, are on view.



The G.I.C. High-Power Gas-Lamp.

Westmoreland Coal Company, of Philadelphia, U.S.A.

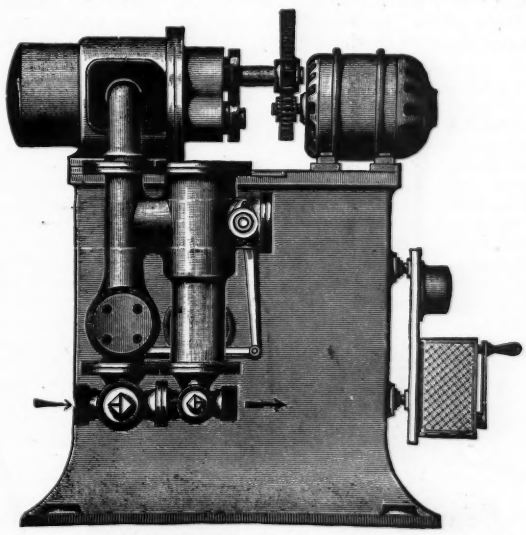
(Stand No. 51.)

This is a modest but nevertheless interesting exhibit in the section of the Queen's Palace devoted to "Continental" exhibits. It consists of a pyramid of about 2 tons of screened lump coal, 6 feet in height, and erected on a pedestal 6 feet square. The wall space in the rear is covered with pictures of the Company's mines and equipment, and a few large sized placards conspicuously placed describing the quality and analysis of the coal, and the record of the Westmoreland Coal Company. Surmounting the whole is a large display sign of heavy black letters on a white background, balanced on either side by a large reproduction of the Company's trade mark—a red triangle within a circle of white. A generous supply of circulars for distribution are to be found at the stand, describing in detail the merits of the coal for its different uses, the yearly output of the Company, &c. The coal used in the exhibit is not a collection of specially selected large and beautiful lumps, such as usually are found at such displays; but it was selected rather with the idea of showing to the public the general appearance and careful preparation of American Pennsylvania gas coal, as supplied to the customers of the Company. This is the only exhibit of American gas coal; and for this reason, and for the opportunity afforded for comparing the appearance of American with English coals, the exhibit should be one of especial interest to gas engineers.

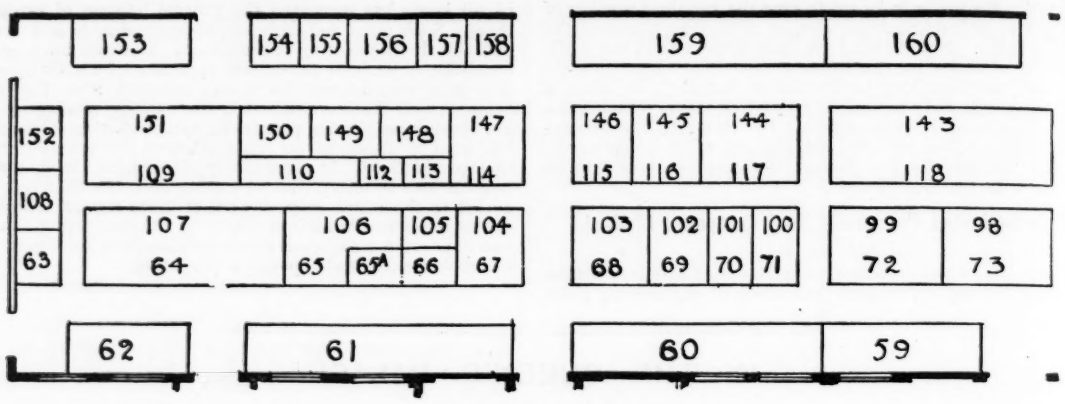
Pharos Light Company.

(Stand No. 53.)

Little has been heard in this country of the Pharos light; but a recent journey in Germany has made it clear that it is a light that is looked upon with much favour among our German friends. At this stand, much may be learnt about the system. It is to Mr. B. A. List, the Manager of the Pharos Light Company in this country, that we are indebted for a part of the information included in this notice. The plant may be seen at work at the stand; and the interior result may be judged by examining the Pharos lighting in section 8, from the Warwick Road entrance up to the Ducal Hall, while the exterior result may be witnessed in section 7 around the water-shoot. At the stand will be seen a compressor of the No. 1 size, which has a capacity of 282½ cubic feet per hour, and is intended for about 20 burners of average size. There is also shown the electric motor for the former, a burning-off plant for mantles, and a compressed-gas meter. The lamps in action at the stand consist of a Pharos chandelier, eight various patterns of indoor and outdoor lamps, factory-lamps, and several decorative lights. The installation for the lighting of the main entrance of section 8 comprises a No. 3 size of compressor, with a capacity of 1236 cubic feet per hour, for about 100 burners of average size, with electric motor and "National" gas-engine for driving. In addition, there is a compressed-gas meter for measuring the high-pressure gas. The installation consists of 22 lamps (twelve in the main entrance, three in the adjoining corridor, and seven in front of the Ducal



The "Pharos" Light Plant.



PLAN OF STANDS.

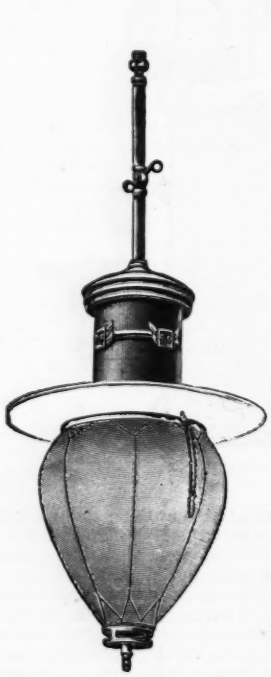
Hall), and a plant for burning-off mantles. Regarding the outdoor installation around the water-shoot, this consists of a No. 2 compressor, of a capacity of 635½ cubic feet per hour, for about 40 burners of average size, with electric motor. There are five single outdoor lamps on brackets, one single-light lamp-post, one double-light lamp-post, one single-light ornamental lamp-post, and one three-branch ornamental lamp-post. In all, the installation comprises twelve outdoor Pharos lamps, and an apparatus for burning-off mantles.

As little is as yet known of the Pharos light in this country, we may mention that the system works on the following principles: The gas, as taken from the ordinary service, is put under a pressure of from 51 to 55 inches (1300 to 1400 mm.) water column, and leaves the burner nipples with greater velocity than gas under ordinary pressure, whereby a large quantity of air is mixed with it. "Through the oxygen of the air, the light is, in the first instance, much intensified, and, secondly, is produced very economically." To obtain the higher pressure, a compressing apparatus is required, which is joined to the gas supply at the meter-outlet. The apparatus consists principally of a rotary pump, which is driven perfectly noiselessly by a small electric motor. The pump and motor are fixed on a plate, which constitutes the cover of the compressor. This compressor therefore forms the foundation for the motor and pump. It consists of two chambers, the first of which serves as a store for the gas at ordinary pressure, which is under suction, while the other receives the compressed gas. The degree of compression is adjusted through a piston, regulated by means of a draw spring, which returns the surplus gas from the pressure-conduit to the suction-conduit. This is, in principle, the whole apparatus. The advantages of the arrangement are stated as follows: "Through using a rotary pump in connection with the suction-gas chamber, the india-rubber bag, which is unavoidable when using a piston pump, is done away with entirely. The small amount of power required to drive the rotary pump is also in its favour. The regulation of the pressure is very simple, and is already adjusted at the makers' works. A connection-pipe from the suction-chamber to the pressure-pipe provides for the feeding of the lighting jets. The arrangement of the lighting device is such that the admission of gas to the bye-pass flame is cut off at high pressure; while at normal pressure the inlet to the bye-pass flame is opened, but closed to the burner. In starting an installation, a lever only has to be moved, and the lamps can be lighted at once. In extinguishing the light, the starting lever is simply moved back." It is also stated that the consumption of double-woven mantles for each Pharos light of 400 candles "is less than the consumption of mantles with ordinary incandescent gas-light, as, to obtain an equivalent candle power with the latter, six burners with six separate mantles have to be maintained."

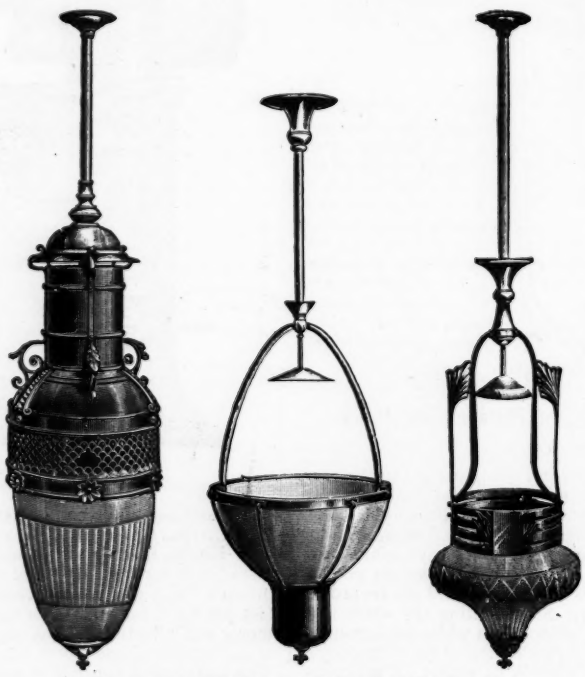
The Gas-Meter Company, Limited.

(Stand No. 54.)

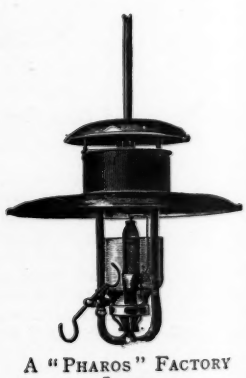
A large group of exhibits, highly finished, and comprehending the extensive range of the Company's various classes of meters, occupy this stand. The central exhibit is a 100-light dry gas-meter (Croll's patent) and cased in glass for inspection. This is the meter illustrated. Also in glass cases for show purposes are two of Croll's patent 3-light dry gas-meters, a 3-light Valon's patent dry stop meter, and a 3-light dry slot meter. Having inspected these, the same types of meter in ordinary cases claim attention—these comprise 3, 5, 10, and 20 light Croll's patent dry gas-meters, a 3-light Valon's patent dry stop meter, and a 3-light slot. Samples of 5 and 10 light dry gas-meters with four-circle indices are observed, and then a 3-light Sandown pattern lamp dry meter. A 5-light wet test meter, in japanned case, and fitted with a pressure-gauge, adjusting pillar and regulating screw, spirit levels and foot screws, and also a large round index, to



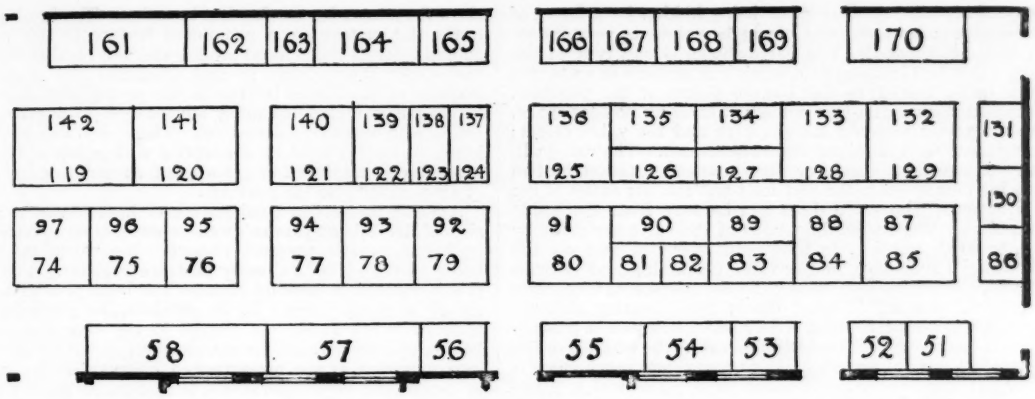
"Pharos" Outdoor Lamp.



Examples of "Pharos" Indoor Lamps.

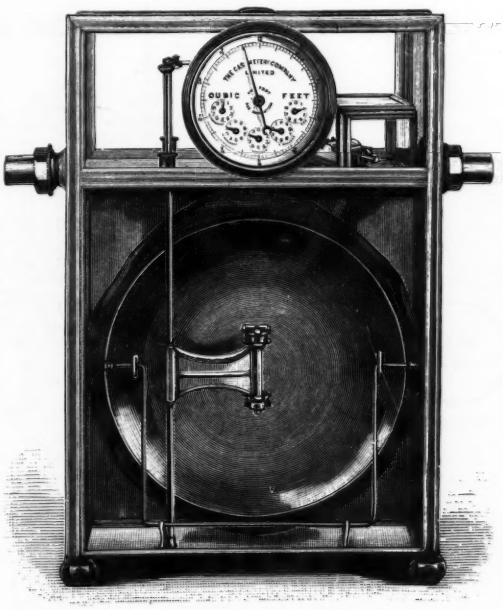


A "Pharos" Factory Lamp.



PLAN OF STANDS.

show the hourly rate of consumption by the observation of a minute, will be of interest to all engaged in the testing of gas. The other meter exhibits embrace: A 3-light unvarying water-line meter (Sanders and Donovan's patent), with glass front to show the system of construction, and fitted with a detachable index; a 3-light "Reliance" wet meter, with detachable index; a 3-light ordinary unvarying water-line meter (Sanders and Donovan's patent), and 2, 3, and 5 light wet meters (West and Gregson's pattern), in ordinary cast-iron cases. There are also on view two



HUNDRED-LIGHT DRY METER (CROLL'S PATENT).

glass show cases containing taps, gauges, and other brass fittings; two or three large size pressure gauges, mounted on polished mahogany boards; samples of 6, 12, and 18 inch single and double Thomas's pressure gauges; a King's pressure gauge; and a pressure-gauge and clock complete. A portrait of Alexander Angus Croll, the patentee of the improved dry gas-meter, will be scrutinized with interest by members of the gas profession who have not seen it before.

Globe Light, Limited.

(Stand No. 55.)

The Company are exhibiting their well-known type of inverted incandescent gas-burners. As has been before explained, a noticeable feature of these burners is that they can be used not only in the vertical position but inclined at an angle to suit various requirements. It may also be pointed out that, in the "Globe" burner, both the gas and the air are preheated prior to burning; and an inspection will show that very special care is taken in the design and construction of the burner to ensure that this result is attained. The fact that the burner is highly effective when placed in a slanting or inclined position opens up a wide field in decorative lighting—a field hitherto considered to belong solely to electricity—and a glance at the Company's exhibit will show that efficiency in lighting value is combined with graceful and artistic effect when the burners are used in this way. It is pointed out as a feature to note that, if circumstances demand, a "Globe" burner can be readily converted into an incandescent gas-burner of the ordinary type, by simply fitting it with the necessary burner-head and mantle support. Used in this way, these burners give specially good results, as will be seen from an inspection of the examples on view. The Company are now bringing out a small form of their burner under the appellation of the "Wee Globe" light. This lends itself admirably to indoor lighting in situations where strong illumination is not necessary. A glance at the table-lamps on the stand will show that these miniature lights are both effective and serviceable; while as to their economy in gas consumption, there cannot be two opinions.

Messrs. Tilley Bros.

(Stand No. 56.)

The visitor will first be interested here by Messrs. Tilley's latest production. It is a gas-fire, made up of the firm's patent telescopic adjustable burners, which enable an ordinary grate to be easily and at once adapted for gas by any gas-fitter. This is, of course, a special feature, and others are the Tilley patent "Seal" main cocks (which were not long since described in the "JOURNAL,") and the "Aspen" anti-vibrator. Other exhibits are lanterns and accessories for street lighting, fittings suitable for indoor lighting under the slot-system or for general lighting, brass main cocks, unions, hardwood blocks, cast mild steel tees, elbows, &c., and sundries for gas suppliers or gas-fitters. The stand, it will be remarked, is, on the front and return side, made up of iron gas pipe and fittings, ornamented by brass gas joints and cocks. It may be added that the work of providing water supplies and waste-pipes to the exhibition stands was placed in the hands of Messrs. Tilley.

Automatic Gas Meter and Governor Company.

(Stand No. 57.)

The title of the Company is information as to the class of exhibits displayed here. In the words of the General Manager (Mr. W. Tice), the Company claim "to have the most simple, effective, and least costly prepayment attachment on show in the exhibition." If this be so, although the Company's meters are not well known, the importance of the prepayment meter industry is such that a novelty in construction, combined with increased efficiency, will naturally force its way to the front, and command attention from those who are interested in it. The Company have aimed at changing the whole character and methods adopted by other makers. Among other points shown to the visitor is a new coin carrier, with an improved ratchet arrangement forming part of it. The slip wheel for taking all strain from the mechanism of the index is a further feature. A novelty in pawls is also introduced to prevent slipping, or the breaking of continuity in the working parts. A tangent or swinging arm on the face of the index, whereby the attachment is put in and out of gear, commends itself. The valve-box, too, is new; and the valve is opened and closed without springs. By this reduction in the working parts, the Company claim a reduction in the cost of manufacture. What is of importance is the assertion that perfect accuracy is attained between the payments made and the measuring index—all escape of gas being prevented which has not been paid for, thus benefiting both consumer and company. Mr. Tice's pressure-governors are shown, and a specially good one for gas-engines. The meters shown are under Beale and Bagnall's patents.

Messrs. Willey and Co., Limited.

(Stand No. 58.)

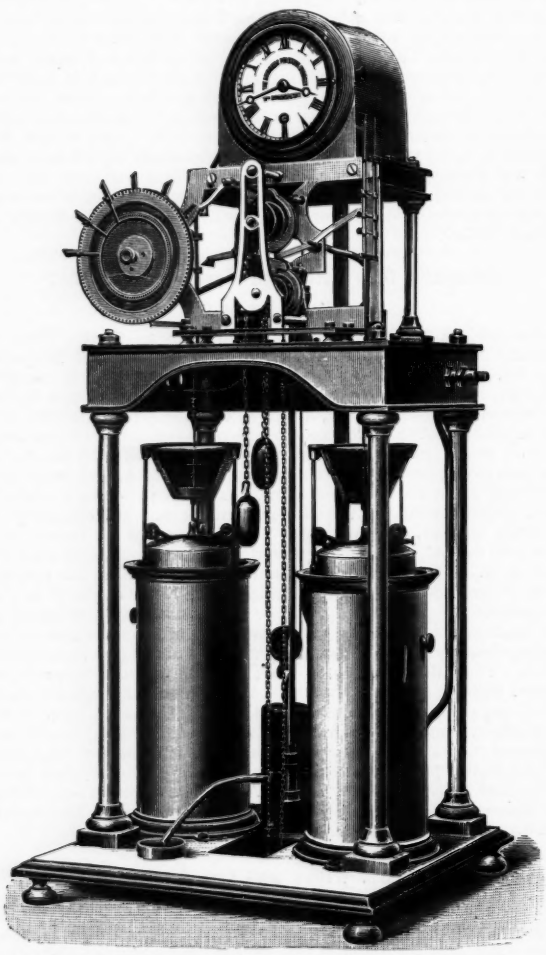
In passing to the stand of Messrs. Willey and Co., Limited, note must first be made of one of the specialities of their engineering department—a Pickering patent purifier valve. It will be remembered that these valves were specially invented to provide a suitable and convenient form of valve to work rubber-luted purifiers. To get the full advantage of this type of purifier, it is necessary to join all the boxes together (preferably in a square), and erect them on a superstructure overhead. With such an arrangement it is almost impossible to use the old style

of centre-valves—the working parts being hidden by a forest of connecting-pipes; and the use of single valves is very inconvenient and complicated. The valve shown is one type of the Pickering valve, and is designed to work four purifiers in a square; this valve being bolted to the bottom plates of the purifiers. Being supported on a cast-iron column, it takes up no floor space, and the gas passes between the purifiers and the valve direct; thus doing away with all pipes and connections. The valve will work any of one, two, three, or four boxes in rotation, by two screws being moved—viz., the first inlet and the last outlet of the series in action. The valve discs can be seen from the inside of the purifiers. Various modifications of the valve are made by the firm, to work purifiers in line, both overhead and on the ground. They have also a similar valve (Pickering and Grove's patent), which is worked by flooding the compartments with water or other liquid, instead of using discs; thus ensuring absolute security. A number of Messrs. Willey and Co.'s patent prepayment meters are shown, with models illustrating the working of the mechanism. A special feature of this prepayment mechanism is its simplicity; there being few moving parts, all of which are in constant gear and independent of springs—thus ensuring perfect accuracy, and that no gas is passed without being paid for. The price is adjusted without change wheels, and can be quickly altered. It is, we are told, impossible to tamper with the mechanism, and obtain gas with the use of any tool through the slot. The slot, too, is closed when the maximum number of coins have been inserted, which prevents the mechanism from being damaged. The exhibits include several other forms of gas-meters, as well as test and demonstration meters. Samples of gas-cookers, fires, gas fittings, pendants, brackets, &c., made and used by the firm in their slot installation contracts are on view.

Messrs. Parkinson and W. & B. Cowan, Limited—Cowan Branch.

(Stand No. 59.)

The Cowan branch of Messrs. Parkinson and W. & B. Cowan are showing at stand No. 59 a large variety of their distinctive

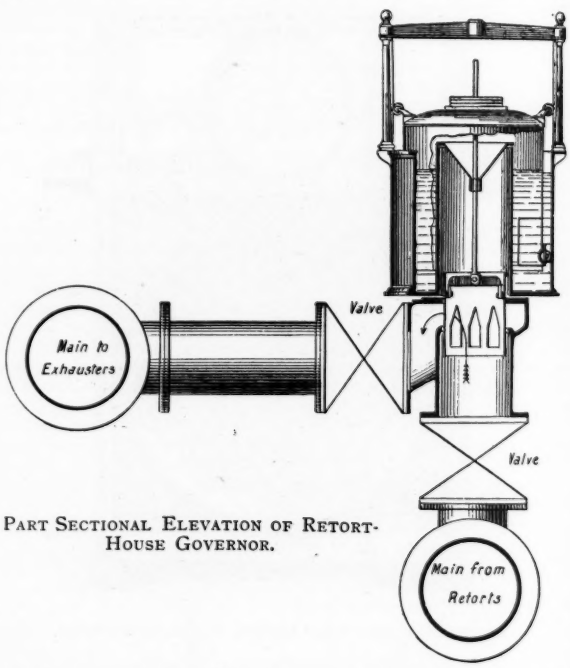


Wm. Cowan's Automatic Pressure-Changer.

manufactures, consisting of gas-meters for various purposes and other gas apparatus. The meters as sent out in execution of orders are here displayed, and highly finished working models show the measuring mechanism in action. The firm's patent coin-in-the-slot meters are a prominent feature in this section, and should interest the general public, who will be able to operate the meters for themselves; so that intending slot consumers may acquire an intelligent interest in the prepayment type of meter, which has conferred so many advantages on hundreds of thousands who formerly burned oil. There are also shown several kinds of meters used in connection with public lighting, and an air-meter as employed in gas-works for regulating the percentage of air pumped into the purifiers.

A highly interesting combination of instruments in action consists of Mr. William Cowan's well-known station governor operated by his automatic pressure changer; the variations of pressure being recorded on a Crosley pressure register. The usefulness of the automatic pressure changer has been proved by the experience of many years. By its services, the gas management is relieved of all anxiety in regard to the changing of pressure, having only to arrange for setting the instrument so as to come into operation at any pre-arranged intervals during the day, and to repeat the same operations, if so desired, for a week without requiring further attention. We are informed that several gas engineers who use this instrument would not now be without it, considering it as an essential adjunct to a good governor. It has become specially serviceable in recent years, in view of the frequent changes of pressure now necessary to meet the varying demands of gas supply throughout the 24 hours, for lighting, cooking, heating, and power.

Another special exhibit is a retort-house governor, devised by Mr. Charles Carpenter, the Chief Engineer of the South Metropolitan Gas Company, at whose various stations it has been very successfully worked for some years past. The function of the apparatus is to maintain any desired vacuum on hydraulic or dry



Part Sectional Elevation of Retort-House Governor.

mains, and to reduce to a minimum all oscillation thrown back by the exhauster, thus making it possible to work with very light seals. This governor was described by Mr. T. Glover, of Norwich, in a paper read before the Eastern Counties Association of Gas Managers, as reported in our issue of April 26 last, and is here illustrated.

For testing and experimental purposes, the gas engineer will find an arrangement of accurately graded meters and a 10-feet highly finished testing holder. He will have a large choice of pressure gauges and pressure and exhaust registers, including Hall's patent pressure alarm and register for retort, exhauster, and governor houses—being specially designed to give warning of over-exhaust and excessive back-pressure. There are also samples of service cleansers, gas-fittings, testers, and several other useful appliances and models.

The stand is particularly attractive in its general design, apart from the interest attaching to the exhibits, which are effectively displayed by the aid of inverted incandescent gas-lamps most artistically grouped.

New Inverted Incandescent Gas-Lamp Company, Limited.

(Stand No. 60.)

A very elaborate stand, decorated in white enamel, has been specially prepared by the New Inverted Incandescent Gas-Lamp Company, Limited, of 23, Farringdon Avenue, London, E.C. In it they have a very attractive and artistic display of their now popular system of lighting; and any visitors who are contemplating

FIG. 1.—NEW INVERTED COMPANY. PENDANT WITH GLASS DISH.

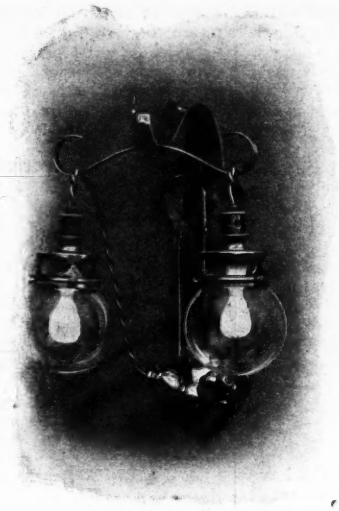


FIG. 3.—NEW INVERTED "BIJOU" FITTINGS.

FIG. 4.—NEW INVERTED "BIJOU" FITTINGS.

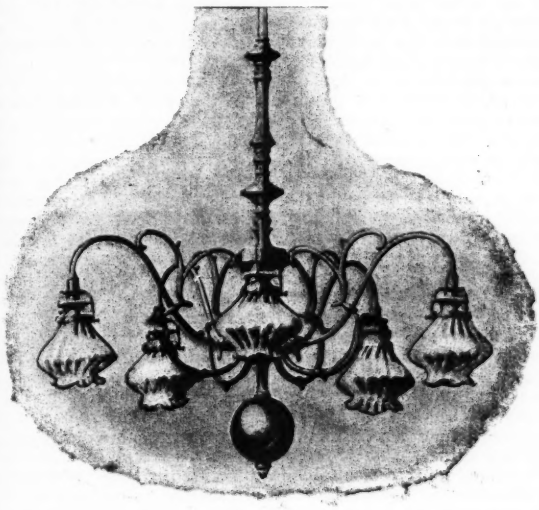


FIG. 2.—NEW INVERTED COMPANY. PENDANT WITH "BIJOU" BURNERS.

installing light should be recommended to visit this very pretty display. Many of the fittings designs are on the lines of those made for electric lighting; and it is apparent that, with such delicate fittings procurable for gas illumination, the electric light has a stronger rival than ever in gas for domestic lighting. We cannot describe the exhibited fittings in detail; but it will suffice to say that the variety and novelties are very numerous. The light illustrated first (fig. 1) has a very charming effect. It is a pendant, with a glass dish attached, through which the rays of light are radiated; and this novelty will commend itself to those who inspect it. It is no doubt an ideal light for an entrance hall. Another very effective design of a pendant, fitted with this Company's "Bijou" inverted burners, is seen in fig. 2. This, however, is only given by way of example, as there are many similar fittings in the exhibit. Attention is also drawn to a very neat adjustable pendant, especially suitable for office use, or for any positions where an adjustable pendant is wanted. When fitted with a silk shade, it is a most convenient light for the dining-room table.

There are on view a number of neat fittings for the "Bijou" burners, such as those in figs. 3 and 4. As the gas passes through very small twisted tubes, it bears a close resemblance to the corded electric light wires. All who visit the exhibition will not fail to be impressed with this exhibit; and there can be no question that the display will add very greatly to the popularity of this new method of lighting.

Messrs. B. Gibbons, Jun., Limited, and Gibbons Bros., Limited.

(Stand No. 61.)

This is a combined exhibit, and, of its kind, a very fine one. In the background are full-sized sectional drawings of horizontal and inclined generator and regenerator retort-settings; and there is a quarter-scale model of Gibbons and Masters' patent "A.B.C." regenerator setting of 12 retorts, which will be built up at intervals in order to show interested visitors the method by which it is constructed. The entire exhibit is in three sections, consisting of: (1) Fire-clay goods, retorts, bricks, tiles, boiler-seatings, &c.; (2) the drawings already mentioned and others; (3) retort-house fittings, retort-bench, and general constructional steelwork; (4) elevating and conveying machinery, coal-breakers, &c. Among the exhibits are a 15-feet tapered retort, showing Gibbons' system of setting for mechanical charging and pushing-out coke; and a half-scale model of their 18-inch push-plate conveyor, which can be shown in motion. Samples of their conveyor chains and fittings, after two years' continuous wear in gas-works, are on view, and bear striking testimony to the quality of the firms' work. Samples of patent steel roller-chain, as tested by Messrs. D. Kirkcaldy and Son, may also be seen.

Messrs. James Stott and Co.

(Stand No. 62.)

The Stott gas-governor has, by its delicacy and reliability, won for itself a high and extensive reputation; and it is, of course, one of the chief features at this stand. The Stott-Thorp sun-burner, in various forms, also takes a prominent place. The principal feature of this burner is that it maintains absolutely still flames, and that the clusters of reflectors remain perfectly white, giving a very powerful effect. The use of sun-burners in large halls as a material aid to the ventilation is well recognized; but the firm claim that, until the introduction of this powerfully reflecting sun-burner, the consumption of gas was altogether out of relation to the amount of light yielded. The special pattern of shadowless sun-burner has, we are informed, been largely adopted for theatres and like buildings, as it casts no shadow whatever upon the ceilings. Anti-vibrating pendants, with enamelled reflectors, are also shown. These are particularly useful for lighting schools and public rooms generally. Fans and other ventilating appliances complete a very comprehensive collection.

United Chemical Works, Messrs. Julius Norden and Co.

(Stand No. 63.)

All visitors will be interested in this stand. The exhibits are very similar to those described in connection with the display made by the firm at the recent Ironmongers' Exhibition, as described in the "JOURNAL" at the time. The collection of raw materials used in the manufacture of mantles which the firm exhibit will specially attract the attention of those who have not made a previous intimate acquaintance with the process. The "Ino" mantle is the speciality here; and it is represented by numerous samples of the various sizes and qualities.

Staveley Coal and Iron Company, Limited.

(Stands Nos. 64 and 107.)

There are some heavy goods at this stand in the way of pipes, &c., some of which are representative of those used in important gas and water work in the country. They are so varied in size and character, that we can do little more than catalogue them. Foremost will be noticed the two archways, consisting of tunnel plate segments for the Rotherhithe Tunnel. Following are some examples of big pipe work—for instance, a 60-inch cast-iron socket and spigot pipe, 9 ft. long, as used for sewerage work at Birkenhead, a 45-inch socket and spigot pipe, 12 ft. long, as used for the Derwent Valley water scheme, and a 42-inch pipe, as used for the Liverpool Corporation Water-Works. Of the same type of pipe is an 8-inch one, as used for the Sheffield Corporation Water-Works, a 6-inch one, as used for the Sheffield United Gaslight

Company, and a 4-inch one. as used for ordinary gas and water supply. The remaining exhibits comprise a section of a 6-inch socket and spigot pipe, 12 feet long, and a section of a 4-inch pipe, showing the regular thickness of metal throughout; a rack, showing 8, 6, 4, 3, 2, and 1½ inch pipes, 12 ft., 9 ft., and 6 ft. long respectively; three sections of 6, 4, and 3 inch turned and bored joints; bends from 1½ to 4 inches in diameter of various angles, 3, 2, and 1½ inch socket spigot, with socket outlets; two 3-inch socket and bell and spigot and bell-end pipes, as used for telephone work; a 12-inch double flange pipe, bored throughout, as used for pneumatic tube despatches, for pumps and hydraulic work; two gas syphon-boxes, 4-inch horizontal and 2-inch vertical; two 6-inch pipes, common sockets, 12 feet turned outside from end to end, showing the quality of the cast iron; and one each of 6, 4, 3, 2, and 1⅝ inch lug pipes, cast vertically, turned all over, showing the quality of the metal. A special feature of these lug pipes is that they are cast vertically, thereby doing away with chaplet irons as used when cast horizontally. The clean character of all the castings will be remarked.

Messrs. John G. Stein and Co.

(Stand No. 65.)

Through time and space pressure, Messrs. Stein and Co. have found it impossible to send more than a comparatively small exhibit of their goods from Scotland. They are showing some "Bluebell" silica bricks, containing 95 down to 85 per cent. of silica, and suitable for withstanding the highest temperatures in regenerative settings of gas-retorts. Notice will also be taken of the ganister or silica bricks, containing from 85 down to 75 per cent. of silica; these being particularly suitable for arches and other parts of regenerative settings where the heat is too great for fire-bricks. The "Thistle" fire-bricks are another speciality, and constitute the principal part of the exhibit. These are made from the celebrated Glenboig clay, of which the firm claim to possess "the largest and purest known field." These bricks are shown in a large number of standard shapes and sizes, all of fine colour and quality, and of superior workmanship. The almost perfect shape of these bricks enables them to be built with close beds; and this is assisted by the fire-clay and ganister or silica being particularly fine ground.

Messrs. Taylor and Co.

(Stand No. 65A.)

Readers who have lady friends visiting the exhibition should make a point of taking them to see this exhibit; for there are to be seen here tasteful accessories for decoration purposes such as appeal to them. There are in abundance shades in cardboard or silk for billiard lights; and cardboard, silk, and lace and fancy paper shades for ordinary gas-lamps—that is to say, as used for inverted burners, both large and small, and for incandescent "C," Kern, and other burners—either central or bracket lights. In addition, there are artistic silk and lace shades for hanging pendants, harp lights, and other central gas-pendants. Artistic screens made of mica, and mounted in handsome brass and iron frames for use in front of gas-fires, are another of the firm's specialities. These screens are said to be the only ones that can be used successfully to modify the very great heat of a gas-fire, as mica is practically indestructible. Anyway, the designs are quite unique. All kinds of mica goods for the gas lighting trade—such as chimneys for the incandescent light and all kinds of protectors—are exhibited. A special feature is made of a mica "chimney" to be used with inverted burners; and the firm venture to think that this will be very generally appreciated by the trade, for the reason that the chimneys neither break nor unduly absorb the light. They should, of course, be used with a silk and lace shade; as, in themselves, they are articles of utility, and not of beauty; but the users of inverted burners will be able to appreciate the advantages of a mica chimney over a glass shade.

Messrs. Blagden, Waugh, and Co.

(Stand No. 66.)

Here will be found a large and interesting collection by the above-named firm of the chief products of gas manufacture, excepting coke. The exhibit is divided into three groups: (1) Ammoniacal products, (2) cyanogen products, and (3) tar products. The following are the chief derivatives shown: Ammoniacal liquor, 880 liquid ammonia, sulphate of ammonia, muriate of ammonia, carbonate and nitrate of ammonia. Crude cyanogen, prussian blue, yellow and red prussiate of potash, yellow prussiate of soda, cyanides of potassium and sodium. Crude and refined coal tar, crude naphtha, benzols, toluols, xyloles, solvent naphthas, pyridines, nitro-benzols, nitro-toluols, aniline oil and salts, aniline dyes, crude and crystal carbolic acid, aurine, trinitrophenol, salicylic acids, cresylic acids, soluble creosote, carbolic powder, green oil, anthracene, anthraquinone, alizarine, creosote oils, naphthalenes—crude, pressed, spun, balls, sublimed, powder, crystals, candles, artificial indigo, pitch, briquettes. As will be seen, the products embrace the very large field of aniline, alizarine, and naphthaline dyes. There are also products such as dinitro-benzol and toluol and trinitro-phenol, which are now extensively used in the manufacture of explosives. Attention is also called to creosote for impregnating sleepers; pitch for making patent fuel, roofing felt, and electric traction work; carbolic and cresylic for disinfecting purposes; and cyanides for gold-extraction acids. Perhaps the most recent and, therefore, the most interesting exhibit will be the artificial indigo, which is now fast displacing the natural article.

The General Heating and Lighting Company, Limited.

(Stands Nos. 67 and 104.)

Among a large number of exhibits, this Company are showing several of Mr. Julius Moeller's patent burners; and Mr. Moeller is confident that a visit will carry conviction as to his claims. Primarily will be noticed representatives of the four sizes of Moeller's ordinary burners, consuming respectively 3, 4, 4½, and 6 cubic feet of gas per hour at ordinary pressure, and giving an average of 27½ to 30 candles per cubic foot of gas consumed. It is claimed for these burners that they are "the most simple and most effective known;" there being no gauze, no sieve, no perforated cones or plates, and nothing to get choked or to corrode. The burner is constructed in such a way that there is no obstruction of any kind between the gas-nipple and the outlet of the burner-top. A gas and air mixture is obtained which combines high velocity and intimate mixture; and this produces what is described as an intensely hot and short flame, rendering the mantle highly incandescent, without the use of a chimney or any artificial draught. The Moeller "C.D.," or central draught, burner is shown. In this case two mantles are used—an inner and an outer one; the flame playing between the two and rendering them both incandescent. The gas and air mixture produced with this burner is of the same intensely hot character as the one described in the first series of burners. But it has an annular parallel flame; and the burner top is constructed to allow a special air-inlet into the inside of the inner mantle. These burners give quite 30 per cent. more light than the single mantle burners; and no chimney is required. The "C.D." burners are made in three sizes—viz., Nos. 5, 6, and 7, consuming 4½, 6½, and 8 cubic feet of gas an hour respectively, and giving from 35 to 40 candles per cubic foot of gas consumed, at pressures varying from 1½ to 2½ inches. Illustration is made of the application of the burners to private as well as to street lighting. Street-lanterns of a new and improved type are also shown, with large reflecting surfaces—concave and convex reflectors of light and neat pattern—in various designs, and fitted with a most effective method of adjustment for renewing mantles and glasses. The globe or cylinder is fitted on to a stuffing-box slide on the stand-pipe, and adjusted with a collar and set-screw. This enables the frame or gallery carrying the glass to slide up and down when the mantle requires to be replaced, which can be done in any weather—wet or fine—as the mantle is fully protected by the glass when down. Suspension lanterns of new designs and large reflecting surfaces, fitted with one, two, or four burners, with convex reflectors suitable for illuminating large open spaces are also shown. Indoor lanterns are seen in a very large variety of designs suitable for shops, work rooms, and places requiring strong and simple fittings at a reasonable cost. Compressing apparatus for water pressure and a hot-air engine are on view, together with all kinds of gas-lighting arrangements, for either high or low pressure systems.

Messrs. Drakes Limited.

(Stands Nos. 69 and 102.)

To say that Drakes Limited occupy the stands numbered as above, will almost suffice to inform the gas engineer and manager what they will find there; for, as constructing engineers, the firm have left material records throughout the length and breadth of the country, which have made their work of common knowledge. Their exhibits comprise: A model of their patent tube regenerator furnace; Connelley's patent governor; inclined and horizontal mouthpieces with self-sealing lids and fasteners; various gas and tar valves; various types of feeding and clinkering frames; regulator air boxes and slides; retort-mountings; top and bottom breaker claws; samples of push-plate and gravity-bucket conveyors for coal handling; samples of bar and tray conveyors for coke handling; special pipes and castings; sundry buckets, wheels, pedestals, pulleys; special bricks, regenerator tubes, &c.; and numerous photographs of work erected by the firm.

Messrs. Ashmore, Benson, Pease, and Co., Limited.

(Stands Nos. 70 and 101.)

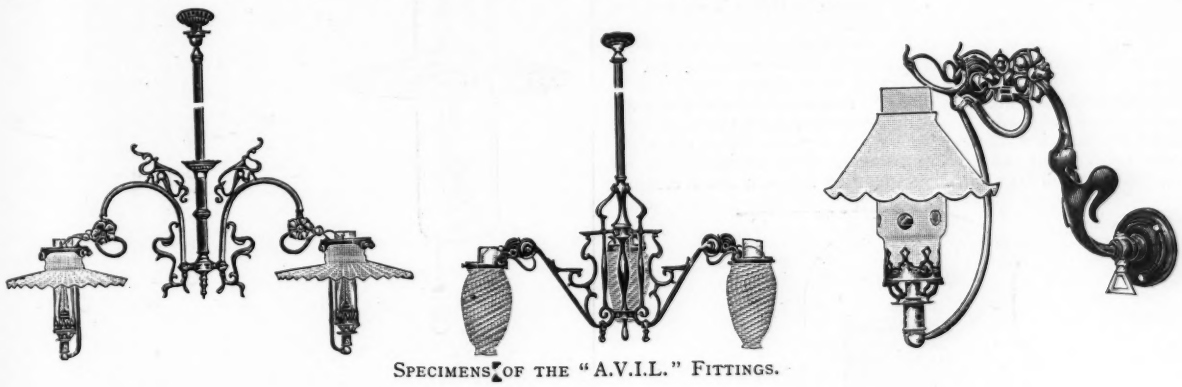
The stands numbered as above, of Messrs. Ashmore, Benson, Pease, and Co., Limited, are occupied by some interesting models, which only represent a part of the large and small plant for which the firm are noted. Foremost is a model of the four-lift holder built for the South Metropolitan Gas Company, 250 feet diameter, with steel standards and patent bracing; a gasholder guided by cables and columns; one similarly guided at three points only; two others cable guided. Perhaps the most interesting exhibit is a working model of a two-lift gasholder in steel tank, showing different designs of guides. There are four distinct types of framing—cast-iron columns, joist, latticed standards,

and plate standards. This model also shows the system of one lift "blowing out." One of the firm's patent mechanical washer-scrubbers is seen, as also one of Green's water distributor and scrubber screens, and one of the same inventor's canvas screens for scrubbers. There is also on view a Colson still, free and fixed, for sulphate plants, a drawing of a Colson patent self-discharging saturator, one of the firm's patent heaters, a sample casting, and a sample valve.

Anti-Vibration Incandescent Lighting Company, Limited.

(Stands Nos. 68 and 103.)

The at one time mystic abbreviation "A.V.I.L." has come to be known so well that, whenever met, it is recognized at once as the popular anti-vibrator system, the patents for which are held by the Company named above. At their stand, they are exhibiting a good representative selection of their various fittings designed to suit every kind of incandescent lighting, whether

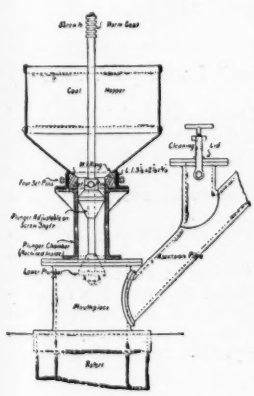


SPECIMENS OF THE "A.V.I.L." FITTINGS.

street, factory, domestic, church, school—in fact, there is no limitation to the situation in which the arrangement in its various forms can be applied. Speaking generally, the system is a combination of spring and flexible tube; and those who have experimented with it for any length of time are high in their praise of the results in respect of the saving in mantles. But the Company, it will be seen, do not stop at anti-vibration fittings. Their street-lanterns, shop, factory, and domestic lamps, and other fittings are of a high order of merit; and an outstanding feature of all is the ingenious application of an anti-vibration device. The simplest plan, instead of attempting to elaborately describe the fittings, is to illustrate some of the forms, from which the reader will be able to judge of the design. Included in the exhibits is Greenall's "Positive" meter, which has more than once been described in the "JOURNAL."

The Settle-Padfield Patent Carbonizing Process.

(Stands No. 72, 99.)



The interest which has been aroused by the Settle-Padfield method of carbonizing in a vertical retort will make the model of the setting of six of the retorts which has been specially constructed for the exhibition, and is on show at this stand, a centre of much curiosity. The model is built to one-quarter the full size. The length of the bench is 4 ft. 7 in., the width 3 ft. 7 in., and the height 3 ft. 7 in.—not including the ironwork. The retorts are provided with mouth-pieces fitted with self-sealing lids. Three of the retorts are furnished with charging-hoppers and plungers which may be worked by hand for the purpose of demonstrating the operation of putting the coal into the retort, &c.

Premier Boiler Tubes, Limited.

(Stands Nos. 72 and 99.)

The specialities to be shown on this stall (which was not quite ready on the opening day) embody valuable improvements in the addition of vertical tubes to the flues of Lancashire boilers. They are made of solid-drawn steel about 2 inches in diameter, and tested to a pressure of 2000 lbs. per square inch. The tubes are arranged vertically in the flue by a special method which prevents leakage; a large number being inserted in nests or groups in a 30-feet Lancashire boiler, 8 feet in diameter, with flues 3 feet in diameter, giving an additional heating surface of about 600 square feet. By the splitting up of the water into small columns, exposed to the flames in the hottest part of the boiler, rapid circulation is caused, which prevents any adhesion of scale inside the tubes. These are so arranged that a man can go right through the flue whenever the boiler is cleaned, and take off all soot, &c., adhering to the outside of the tube. It is claimed that the use of "Premier" tubes in Lancashire boilers will increase their efficiency by at least 20 per cent.

A ring filled with the tubes will be on view during exhibition, as well as a model showing the general arrangement, and numerous drawings of plant.

"Rotary" Meter Syndicate, Limited.

(Stands Nos. 71 and 100.)

When the original advocacy of the slot-meter system by Messrs. Thorp and Marsh is remembered, the gasman will turn with particular interest to the stand of the Rotary Meter Syndicate to see what new suggestions, if any, they have to offer. "Adopt slot-meters" was the firm's old advice. "Sell gas for fires and

THE NEW "ROTARY" METER.

gas-stoves by means of the discount meter" is their new advice. Under interesting circumstances, as we shall show presently, this meter is to be seen on the stand.

There is, however, a larger exhibit to be first noticed. This is a station meter, capable of passing 20,000 cubic feet of gas per

hour. The meter is intended for use in connection with coal-gas works, water-gas plants, and similar purposes. It is also suitable for the measurement of gas or air under pressure. One of the advantages claimed for the meter is that it is equally applicable for the measurement of gas at 5-10ths pressure or at 5 lbs. pressure; there being, in fact, no limit to its capabilities in this direction. It is small in size, in comparison with the ordinary type of meter; and freedom from liability to wear or depreciate quickly, and general accuracy, are the special points claimed in connection with it.

The great novelty, however, which is being shown on the stand is the discount meter. The use for which this meter is intended was fully explained in the "JOURNAL" for May 17 last. On the stand there is a gas-fire, the supply to which passes through an ordinary test gas-meter and then through a discount meter, so that the registration of the two can be compared at a moment's notice. The test meter and the discount meter are at the disposal of any experts who may visit the exhibition and who desire to test for themselves its reliability. There is not only an exceedingly large field for the service of such a meter as this in England, but also in all countries where gas is used.

Another feature of the stand is the water-gas cycle recorder. This instrument is intended as a check on the working of water-gas plants. It is well known to users of these plants that "a little neglect may breed great mischief." But when a water-gas plant has in connection with it one of these instruments, the engineer is enabled to see at a glance what has taken place during the whole of the preceding 24 hours. In the event of the attendants having run the blow too long, great depreciation follows; and if steam is

WATER-GAS CYCLE RECORDER.

allowed to pass longer than the specified time, a great quantity of carbonic acid goes forward, with the result that the purifying account increases by leaps and bounds. This shows at once the utility of the instrument, which enables the engineer to stop at once any negligent attendance. On the diagram is shown, on each cycle, the length of time air is passed through the generator, the period during which steam passes through, the time occupied in charging the generators with coke, the time occupied in clinkering and clearing the fires, and the amount of oil used for enrichment.

On the stand there may also be seen various types of pressure recording instruments, safety lamps, a newly-invented district governor (now exhibited for the first time), and an anti-pulsator for use with gas-engines—more especially suitable for those of large power. The latter apparatus has been particularly designed for the purpose of meeting the growing want which has been so evident during the last few years, when engines of much larger size than those of the past have come into general use.

Mr. George Wilson.

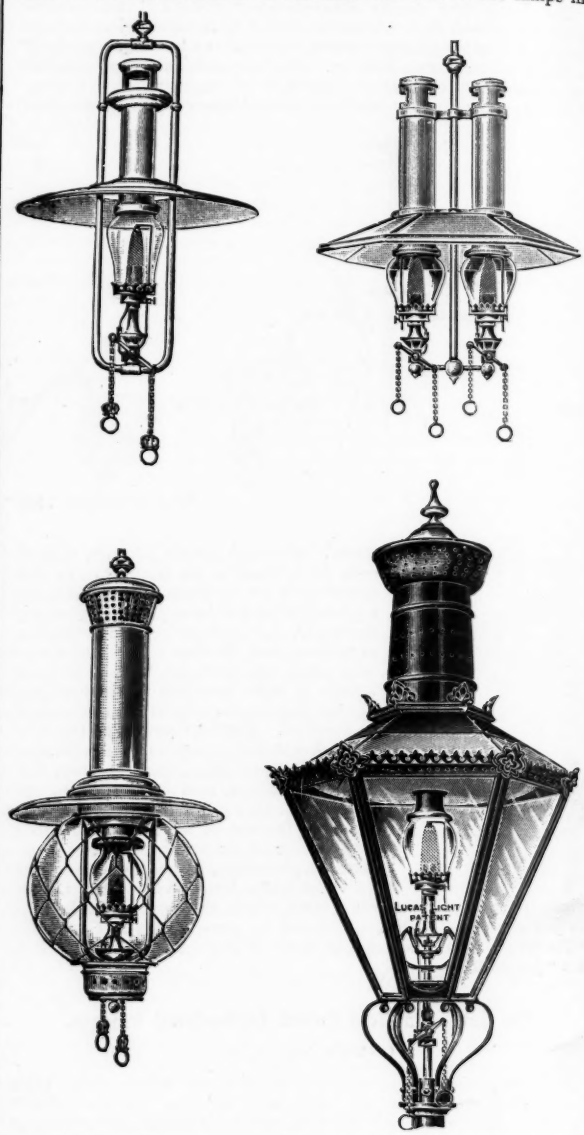
(Stands Nos. 73 and 98.)

We have before had an opportunity of judging of the excellency of the productions of Mr. George Wilson in the way of gas-meters and such-like apparatus; and a description was published of them at the time of the small exhibition at the Crystal Palace last year. Their principal features are now as then. The central exhibits are a station meter in cylindrical case with clock; cylindrical tell-tale and jumping indices; ordinary and prepayment wet and dry gas-meters in glass cases for the examination of their principal parts; pressure and exhaust registers, &c. The meters are shown in several sizes and for English and foreign measurement.

Messrs. Moffats Limited—Lucas Lights.

(Stands Nos. 74 and 97.)

A brilliant display is being made by this firm with their usual styles of lamps for indoor and outdoor suspension lighting, with examples of 200, 400, and 700 candle powers. Indoor lamps in coloured enamels, with gold lining, as well as in the ordinary black and white enamel, are features worth inspection, as are also samples of two-light and three-light cluster indoor lamps, which can be supplied fitted with two or three lights of 200, 400, or 700 candle power each. A special dual bye-pass arrangement is shown, intended to facilitate the use of the lamps in



VARIOUS TYPES OF THE "LUCAS" LAMPS ON VIEW.

public buildings and factories. The lamp is lighted by means of a climbing bye-pass; and the central bye-pass is then brought into operation. The lamp by this means can be manipulated from any distance by a cock fixed on the supply, which enables the lamp, or a series of lamps if desired, to be switched on and off as rapidly and easily as the electric light.

Moffats Limited also light up a section of the grounds close to the main exhibition building; and they are showing there a selection of the single and cluster burner street-lanterns and some lantern columns, specially designed to meet the requirements of the Lucas lamp. It is stated that the heads of the street-lanterns have recently been very much improved, and can now be guaranteed as absolutely windproof.

The Ferrubon Manufacturing Company, Limited.

(Stands Nos. 76 and 95.)

The protective value of a good coating of paint is too well recognized to allow an exhibit of a special paint to be passed unnoticed. The Ferrubon Manufacturing Company hold that they have a paint specially applicable for gas-works purposes.

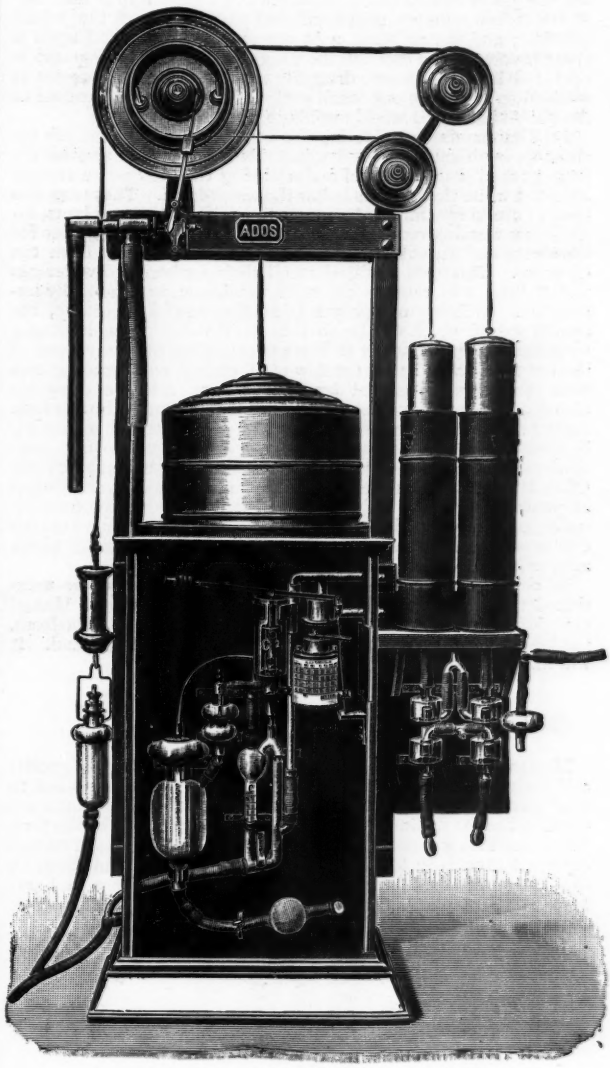
Their paint, we have been informed, possesses an imperishable base—a powder of a pure non-oxidizing oxide of iron of very fine flakes, which is derived from the Company's mines in Devonshire. Among the other commending features advanced are these: "The powder does not destroy the oil with which it is combined, but protects and preserves it from premature decay. The paint forms a tough elastic covering that adheres most tenaciously and hermetically close to the metal surfaces, and expands or contracts with these under varying temperatures without cracking or peeling off. It stands steam or hot water, and great heat or cold. Its base being unaffected by any acid or strong gases, it recommends itself as a protection of plant and metal structures in chemical, gas, and other similar works." The range of colours, it will be remarked by the visitor, is a wide one.

Messrs. Samuel Cutler and Sons.

(Stands Nos. 75 and 96.)

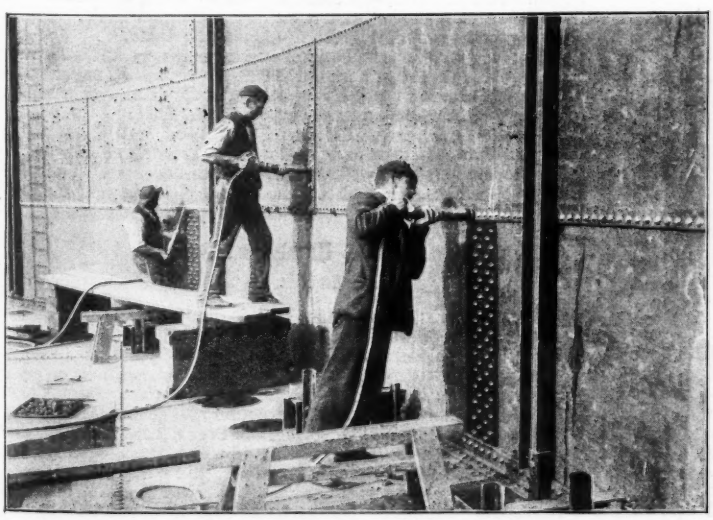
The gas-works contracting firms are necessarily in the position of being unable to exhibit their chief productions in kind; but Messrs. Cutler (as several other firms) minimize this disadvantage by placing on view an admirable array of photographs illustrating some of the many important engineering works with which they have been entrusted. Gasholder construction, in which this firm has such an acknowledged and world-wide reputation, naturally occupies a prominent place in the collection; but there are also many notable works in general engineering of very diverse kind, such as the enormous grain silos and elevator towers constructed for the Millwall Docks Equipment Company, the steel retort-houses at Swansea, Southall, and Dartford, the coal discharging pier and viaducts on the Thames at Southend, &c. Another series of photographs displays some of the firm's well-known carburetted water-gas plants, which it is noticed have been adopted in Holland and South America, as well as in many English gas-works. In connection with the gasholder exhibit, some striking figures are observed regarding large holders constructed by the firm; a list of twenty of the larger being instanced, of which the first six on the list represent a total capacity of above 36 million cubic feet. Another interesting table refers to Messrs. Cutler's patent system of guide-framing for holders, and states the location, dimensions, and capacity of some thirty holders constructed on this system. A photograph is also shown of a spiral-guided columnless holder on the Gadd and Mason principle, which the firm have just completed at the Granton works of the Edinburgh Corporation, for use as a relief holder in connection with the carburetted water-gas plant. The special feature of this holder is a patented method of jointing the side sheets, which, while permitting the spiral guides to be closely bedded upon the side sheets, does not involve the use of any diagonal strip plate; the side sheets all being of the usual rectangular form. In connection with these exhibits, the steel tank is an increasingly prominent feature; and they instance some forty examples of steel tanks, many of very large dimensions. The trend of gas engineering practice seems to be in favour of this method of tank construction as being less costly, and more certain in result, than masonry tanks.

There are several models exhibited by Messrs. Cutler which will attract general attention, especially one illustrating the Jäger system of purification, which shows in the most lucid manner the essentials of this interesting system. Although the system was only introduced in this country in March of the present year, the information is given that it is in actual use, with most marked success, in several large English gas-works, and other installations are under way. The patentees claim for the system that it practically doubles the capacity of any purifier, and at the same time reduces the pressure to a degree unattainable in prevailing systems of purification. In substantiation of these claims they exhibit some very striking pressure charts compiled from daily working records taken by the Gas Company's officials at the Chester, Hull, and other gas-works where the system is in use. The inconvenience and danger of heavy and fluctuating pressure in water-luted purifiers needs no emphasis to the experienced gas manager; and if the reduction of pressure carries with it, as seems undeniable with this system, a greatly increased efficiency in the exhaustion of the material, then Messrs. Cutler may be assured of a great demand for the improvements which they have introduced. The model exhibited illustrates the type of grids and accessories as made for all installations at present supplied; but we learn from Messrs. Cutler that they have acquired, in addition to the master patent for this system, a number of subsidiary patents covering variations of details which they will use as occasion demands.



The "Ados" Carbonic Acid Recorder.

Another interesting exhibit is the "Ados" carbonic acid recorder, which we commend to the notice of all who wish to achieve fuel economy in their retort-benches and boilers, and a continuous record of the percentage of carbonic acid present in the gases produced in the generators of carburetted and blue water-gas plants. We are not aware of any analogous automatic device in use on gas-works. The apparatus automatically ascertains, and records upon a continuous chart, the percentage of carbonic acid in the waste gases passing from any furnace. It is said to be quite simple but certain in action, and produces a reliable and



Messrs. S. Cutler and Son's Men Riveting and Caulking a Large Steel Tank by Pneumatic Machinery.

impersonal record of the whole day's working upon a chart in the same manner as any ordinary gas-works pressure register. Its working is based upon the well-known fact that a solution of caustic potash absorbs carbonic acid gas. A definite quantity of the flue gas is automatically withdrawn by a gas-pump at intervals of about five minutes, measured, and passed through the potash solution; and the carbonic acid percentage is recorded upon a chart revolved by a clock in the usual manner. The gas-pump is operated by the chimney draught; and the whole apparatus is self-acting, requiring only such periodical attention as renewal of the daily charts and weekly refills of the potash solution.

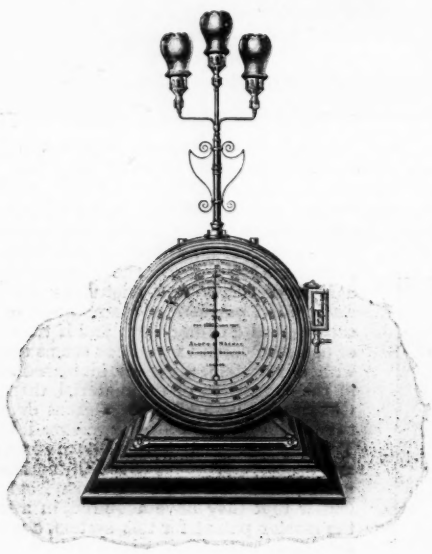
Brief notice must suffice for the remaining exhibits, which include an ingeniously devised adjustable bottom roller suitable for large gasholders; the novel feature being that it can be readily adjusted while the roller is below the water-level. There are also several useful specialities in connection with water-gas plants, including a working model of Messrs. Cutler's interlocking gear for the steam and air valves, of which they claim to have been the pioneers. This gear is fitted to all their carburetted water-gas installations, and renders errors of manipulation practically impossible. A lifting oil-sprayer is another useful accessory, the advantage of which will be obvious to all water-gas makers, as it withdraws the necessarily delicate parts of the oil-sprayer out of the hot zone immediately the flow of oil ceases, and protects them from the action of the heat during the blows. A folio of drawings also illustrates some of the specialities manufactured by this firm, among which are noticed some improved details for inclined retort-benches, drawings of the well-known Cutler water-tube condensers, also detail drawings showing the construction of the Chas. Hunt patent washer, for which the firm have several orders at present in hand. This apparatus is designed to perform all necessary tar, carbonic acid, and ammonia purification within the one vessel, and is reported to have been very successful where adopted.

In closing this review of the firm's exhibits, it may be mentioned that they are now constructing for the Sheffield United Gas Company, to the design of their Engineer (Mr. J. W. Morrison), the largest gasholder that any firm have at present in hand. It will have a capacity of 7,800,000 cubic feet.

Messrs. Alder and Mackay.

(Stands Nos. 77 and 94.)

Messrs. Alder and Mackay present a fine collection of goods; and their character is so well known and appreciated as not to need particularizing. Wet and dry meters of various kinds are exhibited as the distinctive articles of commerce made by the firm. There are also wet and dry ordinary and penny-in-the-slot meters designed especially for show purposes, with glass panellings so that the mechanical parts are displayed at work. Here we have, too, the "Scotsman" penny-in-the-slot meter, which is of historic



THE "DEMONSTRATION" METER.

interest, and has a unique record for a meter in collecting alms. Within six months at the Glasgow Exhibition, 1901, it gathered in a sum of £121 1s. for the benefit of the widows and orphans of those who died fighting for Great Britain in the Boer War. In an air-tight case, the firm also present to view the various metals and materials employed in the manufacture of a dry gas-meter. A novelty is a cheap, simple automatic apparatus for lighting and extinguishing gas-burners, street-lamps, &c. (shown in operation). An experimental gas-governor of a new and very simple type is also exhibited. The bell is fixed so that it neither rises nor falls; and there are no moving parts displayed.

The "Demonstration" meter, exhibited for the first time, is designed to show, in a manner easily understood by any consumer, the value in light or heat he is getting for each penny he pays. The meter is constructed either wet or dry, as preferred. In either case it may be connected from above or from below, as the couplings are interchangeable. In the event of a change in the price of gas, the dial is also easily interchanged, and Messrs. Alder and Mackay say they can supply, at once, any dial showing the necessary figures for each of the three circles from 2s. 1d. up to 11s. 11d. per 1000 cubic feet. The pointer may be instantly set to zero for a fresh observation, when required; and the wet meter is fitted with a spirit level, levelling-screws, water-line box and overflow, &c. As the capacity is 30 cubic feet per hour, it may be used to show the consumption of any burner, fire, stove, &c. The meters are got up in a neatly finished style, with ornamental wood base, and polished brass standard for the burners, &c.

Since the above notes were put in type Messrs. Alder and Mackay write to inform us that they have made an improvement, so that the meter is not properly represented by the illustration. "We have," they say, "arrangements now whereby a valve (which is hidden) regulates the passage of gas automatically and alternately to two burners—one having a flat-flame and the other an incandescent light; showing, in a clear and easily understood manner by the pointer on the dial, in each case the amount of gas consumed by each burner, and a comparison of the light given. This device can be turned off altogether, and the meter used as an ordinary test meter, for testing stoves, gas-fires, or another meter." However, the meter in its proper form is working at the firm's stand.

Mr. William Edgar.

(Stand No. 78.)

Ingenuity has been exercised by Mr. Edgar's staff in the arrangement of his stand; they having made quite an interesting and comprehensive show in a space of only some 15 feet square. For the convenience of the visitor, only the "purely novel" has been introduced. In regard to public lighting, precedence is given to the "Caxton" lamp; and every detail of its manufacture is shown in both tin and copper. Each of the component parts it may be said has quite an engineering distinction of its own. Then there is the "Edgar" patent roller trap, which is made to yield to the slightest movement of either the Foulger-Glover or the Simmance-Abady forch; and, what is as important, the trap gives the minimum of light-obstruction and reduces the vibration on the lantern to a negligible point during the manipulation of the torch. Other details of interest are the patent diagonal corner attachments for the support of the Edgar patent porcelain reflector, which is really quite unique in its simplicity, and which keeps the reflector completely equidistant without undue pressure. The variety of lanterns *en evidence* is too numerous to mention.

In the matter of shop lamps for interior and exterior use, quite notable is the "King" arc lamp. The colour, symmetry, and efficiency are evident in all its parts (the component parts being shown separately). Its popularity is self-evident; it is to be met with wherever one goes all over the exhibition. The "Eclipse," in all copper, is well to the front in up-to-date arc lamps; and so are the lamps for other purposes—for office, warehouse, stores, shops, porch, hotel. The self-intensifying 1000-candle power induced current lamp must be regarded as a formidable opponent to electric light on the score of brilliant efficiency with economy. The small parts of this section are very novel and interesting.

In the gas-heating section of the exhibit, the fit-any-grate fire—the "Blenheim"—takes the palm for simplicity. The salient feature of it is the ease with which a gas-fire in a grate may be built up. In the dog-stove combined with the "Blenheim," a good heating result is obtained as well as being very decorative; the "Sun" dog-stove being specially recommendable. Geysers are the latest addition to the firm's manufactures.

Among gas-fittings and miscellaneous goods, we find some novel ideas—such as Edgar's patent hidden bye-pass and adaptor for inverted burners; the "Hollyhock" pendant; and some unique patterns in brackets, main-cocks, padlocks, &c.

The construction of the stand has been well thought out; everything used being in accord with the nature of the exhibit, even to the four lamp-columns forming the corners. The whole of the effect, in white and copper, is very pleasing and distinctly artistic.

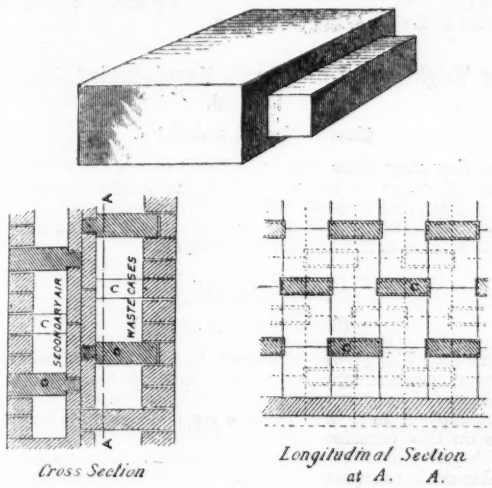
Messrs. Harris and Pearson.

(Stands Nos. 79 and 92.)

The gas engineer will pause at this stand to examine the complete erection of a full-sized arch, and setting of nine retorts, all on a working scale, showing special fire-clay blocks, &c., as made for the Bristol Gas Company. The design shows many very interesting features, and is a thoroughly up-to-date example of regenerative retort-setting. The erection and general arrangement is to the design of Mr. D. Irving, the President of the Institution of Gas Engineers. The material of which the blocks are composed is of specially suitable quality for the purpose.

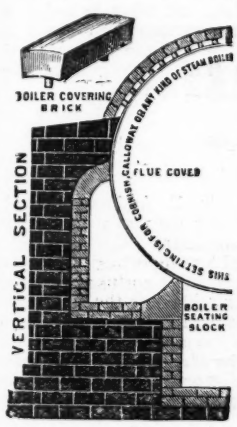
The sample regenerator on view built with Messrs. Harris and Pearson's "Simplex" patent baffle-tiles is a special object of interest. This form of baffle-tile (as illustrated) is for use in the construction of regenerators for retort-settings or other similar purposes; and it enables such regenerators to be built without

employing any other special bricks beyond the "C" baffles and ordinary square tiles. The baffle system of regenerators is claimed to be a decided improvement on the older styles; the advantages of the newer system as set out being: (1) Less draught



THE "SIMPLEX" PATENT BAFFLE-TILES.

required in the setting, owing to less friction in the flow of the secondary air. (2) The distribution of the heat through the setting is under better control. (3) The manner of setting the retorts is simplified. The objection to the system has hitherto been the expense of more or less complicated wall or other tiles. The use of "Simplex" tiles, however, enables the regenerators to be built by any intelligent bricklayer; ordinary square bricks being used in the outside walls. The only tiles required, beyond the "C" baffles, are for the division wall between the waste gases and the secondary air, which are of ordinary sizes. On reference to the illustrations, it will be observed that the division wall is formed of a double thickness of tiles, that these are arranged to break-joint both vertically and horizontally, and that there is no possibility of bye-passing. The wall tiles are securely held in position; each baffle-tile assisting to support six wall tiles, and each wall tile is held by three baffles. The regenerators are thus capable of resisting a heavy lateral thrust, and are also assisted in carrying the weight of the settings above. The cost of the materials for regenerators constructed with "Simplex" tiles, we are informed, is very moderate in comparison with those that are required for other similar systems.


BOILER COVERING BRICK
FLUE COVER
THIS SETTING IS FOR CONSUMING CALLOWAY GRATE KIND OF STEAM BOILER
VERTICAL SECTION
BOILER SEATING BLOCK

HARRIS AND PEARSON'S BOILER SEATING.

These tiles, however, do not by any means exhaust the firm's exhibits. They have brought together a large and excellent collection of refractory goods, Stourbridge fire-clay retorts, fire-clay tiles, fire-bricks, and fire-clay. In addition to the full-sized section of the "Simplex" regenerator already referred to, Klönne and other regenerator bricks are shown. There are also in the collection boiler-seating blocks, flue-covers, and special boiler-covering bricks, forming a hot-air chamber over the outside of the boiler, with a model of a boiler illustrating the system; a cover and muffle, suitable for heating small pieces of metal by electricity; pieces of Stourbridge fire-clay as raised from the mines, also ground and calcined; scale models of gas-retorts in fire clay; grate bricks for fireplaces, buff-facing bricks, glazed bricks, coloured and white, garden vases made of fire-clay, Staffordshire blue bricks for paving and other purposes, and scale models in glass-house pot clay of glass-house pots.

Messrs. Abendroth Bros.

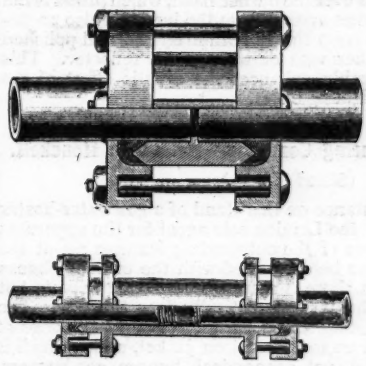
(Stand No. 81.)

This is an American firm of gas-stove makers, who claim as one of the greatest points of argument in favour of their ranges that they are well constructed and that their interiors are so arranged that it is unnecessary to take out any bolts or rivets in order to remove the interior linings. Their safety oven lighter device is said to be "an absolute preventative of gas-range explosions." The operator is first compelled to open the oven door before the oven burners can be lighted. The old-style lighter, they say—such as is known as the "side-pilot light"—has caused thousands of gas-range explosions. Their device, however, is said to afford an absolute preventative; and since it has been adopted, the firm have failed to find, up to the present time, one single mishap in this line.

Mr. S. R. Dresser.

(Stands Nos. 80 and 91.)

All gas and water engineers have an interest in the question of the prevention of electrolysis. Mr. Dresser is showing here his insulating and regular couplings for either wrought or cast iron pipes, which couplings have been specially designed for the purpose of obviating electrolytic action, as well as to make an absolutely tight joint—one which will allow for contraction and expansion, and the settlement of the line of pipes without leaking. It is an American invention; and Mr. Fred. A. Miller is taking charge of the stand. In these couplings, rubber is used; and on this point there has been some doubt as to the durability. In regard to it, the inventor says: "There seems to be an opinion among gas and water engineers who are not familiar with Dresser couplings that the rubber is a very weak point, and that its life is necessarily short. In this connection, I wish to state that, owing to the manner in which the rubber is compressed into the recess of the flange, and against the middle ring and pipe, it is practically hermetically sealed, and any substance carried in the pipe cannot penetrate the rubber. Owing to the perfect compression, it is impossible for any deterioration to take place, and, if undisturbed, the rubber will last as long as the pipe itself. While I realize fully that this statement will be questioned by many, still, after years of experience with the particular compound which I use, I make this statement advisedly, and stand ready to furnish facts which will verify the same." By the use of the couplings, it is pointed out, the conductivity of the piping system is destroyed, with the result that it is impossible for electricity to flow upon the pipes. Another special use is for high-pressure supply. A full line of clamps for repairing leaks on wrought or cast iron pipe is also shown. The patterns of these special pipe-couplings, clamps, sleeves, and other fittings for all sorts of purposes made by Mr. Dresser are numerous. In the last issue of his catalogue will be found reported some interesting experiences (from authoritative sources) resulting from the use of the various fittings. These put any doubt as to their serviceability completely "out of court."

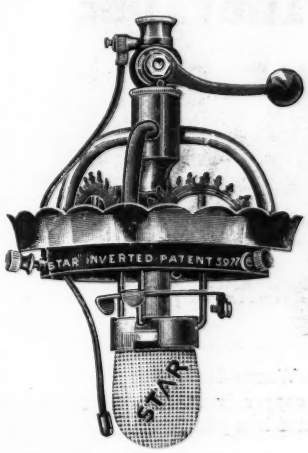


SAMPLES OF DRESSER'S PIPE COUPLING AND EXPANSION SLEEVE.

Star Inverted Incandescent Burner Company, Limited.

(Stand No. 82.)

Not intending to be behind competitors in showing the lighting merits of their inverted form of burner, the Star Inverted Company make a decidedly good show. They have effected certain improvements in the burner, and have extended the types, since they first appealed for public patronage. These will be seen from the lamps shown at their stand in divers finishes—polished brass, steel, bronze, and nickel plated. The Company also have a



A BYE-PASS "STAR" INVERTED BURNER.

A MINIATURE INVERTED "ARC" GAS-LAMP.

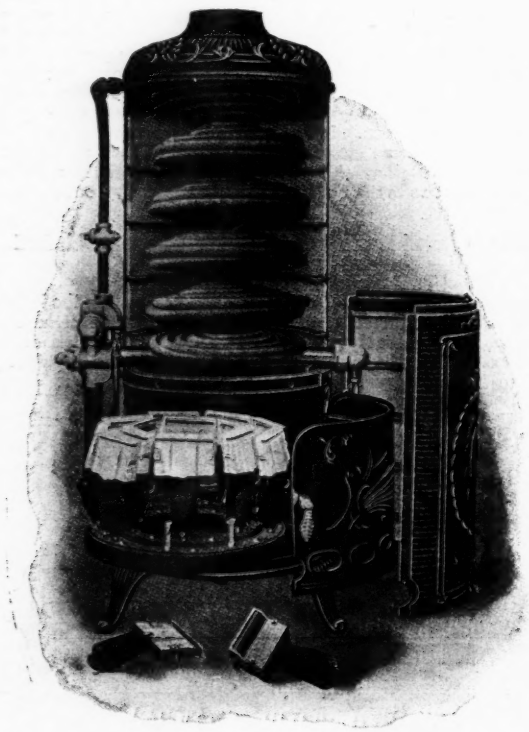
varied assortment of globes, shades, and bulbs for use with same; a very extensive collection of suitable brass and steel stands; and brackets and pendants for the same—some of them exceptionally artistic and striking in character. These latter possibly are almost too fanciful and may be expensive for general use, but yet of a character much sought after where the premises are elaborately fitted up. Two novelties are exhibited—one a heat shield consisting of a small embossed plate over the burner-head, which protects the fittings from the heat fumes arising from the burner; also an inexpensive miniature arc lamp shown both in enamel and polished copper, and supplied either with or without the reflector. This latter, however, considerably enhances the artistic effect of the lamp, and increases its lighting effect.

"Star" Inverted Shade Light.

The Ruud Manufacturing Company—Mr. G. E. Henckell.

(Stand No. 83.)

We make the acquaintance on this stand of a gas water-heater of Pittsburg extraction; the London sole agent for the apparatus being Mr. Henckell. One of the outstanding features about the Ruud heater is that it can be connected with the ordinary house water system; and then there is nothing else to do to obtain hot water in any part—the heater automatically does the rest. The apparatus, as the illustration shows, consists simply of a series of copper coils, encased in an insulated iron jacket, under which is placed a set of powerful, yet economical, bunsen gas-burners. The opening of a hot-water tap in any part of the house turns on the gas, which is ignited by a small pilot light, and in less than thirty seconds, hot water flows, and will continue to flow as long as the tap is left open. An important part of the apparatus is the thermostat, which regulates the temperature of the hot water and controls the flow of gas to the burners in accordance with the heat of the water. Thus we have in this system a double automatic control—one device controlling the gas by means of the pressure of the water, and the other by means of the temperature of the water. The element of safety is therefore largely developed



The Ruud Water-Heater
(Showing movable burners, copper heating coils, and detachable insulated iron jackets.)

here. It is claimed that over 75 per cent. of the heat value of the gas is directly transmitted to the water to raise its temperature; and, if this is so, then it is, indeed, an economical heater. In this connection, the Company state: "With artificial gas testing 650 British thermal units to the cubic foot, the Ruud heater will produce one Imperial gallon of hot water with 1·3 cubic feet of gas consumed. This is based on raising the water to 63° Fahr. in temperature. With gas at 3s. per 1000 cubic feet, this would mean 22·5 gallons of hot water for a penny, or an ordinary hot bath for less than a penny." This should prove an exceedingly interesting exhibit, and the interest will be enhanced when it is known that the Company were awarded a gold and 2 silver medal this year at the St. Louis Exhibition.

The Wright and Butler Lamp Manufacturing Company, Limited.

(Stands Nos. 84 and 88.)

The Company show their "Union" range, their "Paragon" circulating range (in action), and an excellent collection of gas-fires, grillers, and domestic labour-saving appliances. The Darwen patent inverted light adds very materially to the attractiveness of what is in itself a very fine display.

Herr Carl Flügge.

(Stands Nos. 85 and 87)

Herr Carl Flügge, who represents in Hamburg not only certain German manufacturers but several English firms, has had his stand specially constructed for exposing to good advantage, and drawing attention to, the goods of the three or four firms which he is on this occasion specially bringing before the notice of British gas engineers and gas consumers. One section of the stand is made to represent a bath-room, the illusion being assisted by the use of wall paper imitating blue tiles. In one of the cabinets, are shown the "Earl's" bath and the "Court" bath, so named "in honour of the occasion," but both cast and enamelled in Germany. The baths show Herr Jos. Junk's make of gas calefactor (geyser), illustrating a circulating system of hot-water geysers and storage, together with auto-geysers, and a douche and shower-bath arrangement. In another more modest compartment is shown the gas and bath apparatus manufactured by Messrs. Laible and Hettler; the bath being connected with a geyser. Here are also a water-heater, reflector-stoves, gas-fires, &c. The modern gas appliances for domestic and industrial purposes of Messrs. Grimme, Natalis, and Co. are also exhibited—such as gas boilers, cookers, ranges, roasters, burners, &c. The works of this firm are near the Harz Mountains; and there they make their own pig iron and castings. The stoves embody several German ideas, and so will claim attention in order to mark their distinctive features in comparison with those of British make. Specimens are also shown of the ordinary and prepayment meters of the well-known firm trading under the style of the Gasmesser Fabrik Mainz Elster and Co.

Mr. D. Anderson.

(Stand No. 89.)

At this stand are shown samples of Mr. D. Anderson's "anti-vibration" incandescent gas-burner. The general aspect of this burner is very similar to that of the ordinary "C" Welsbach; but an anti-vibration device is provided by supporting the bunsen tube and its base on three small horizontal springs, arranged radially, the outer ends of which are attached to the fixed parts of the burner. The tube carrying the mantle is thus allowed a free lateral and vertical movement, independent of the rest of the burner. The burner has been tested by Mr. Horatio Ballantyne, who reports that it affords a very satisfactory means of mitigating the effects of such vibrations and shocks as are likely to be encountered in practical use.

Messrs. Holbrook and Co.

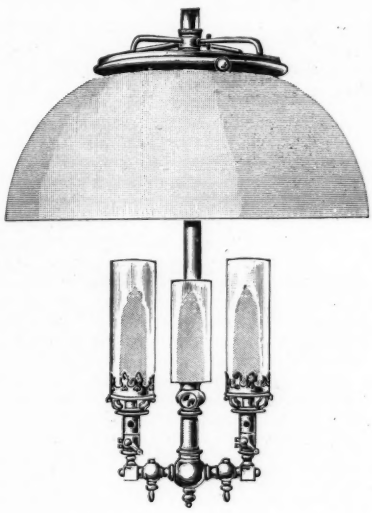
(Stands Nos. 93 and 103.)

Two decided novelties are shown by Messrs. Holbrook and Co., of Hackney. The main features of their exhibit are the "Eureka" incandescent burner and an anti-vibrator. The burner is fitted with a cone-shaped cup, which partly encloses the burner, and regulates the air-supply—the cone being screwed so as to rise and fall on a nipple. It is fixed at any desired point by the upper of the milled collars, which has a locking-nut. The patentee claims, among other things, that perfect combustion can be secured under varying pressures and qualities of gas, and that as the incandescence of the mantle is "perfect" more light is obtained from a given volume of gas than is possible with unprotected burners. This advantage he puts at 25 per cent. It is also claimed that the burner is wind and dust proof; that lighting-back is impossible that the risk of breaking chimneys and globes is reduced to a minimum; and that the life of the mantle is considerably lengthened. To regulate the mixture of air and gas, the lock-nut is slackened and the cup adjusted on the nipple till the proper mixture is found. The "Eureka" anti-vibrator consists of a brass case in which the spring device and flexible tube fitting ride, terminating in a pipe and union to which the gas-pendant, hall lamp, or the like is connected. It is not unshapely in appearance. The firm also make a modified pattern specially adapted for street-lanterns; and they are also showing a very cheap anti-vibrator workshop light.

United Kingdom Lighting Trust, Limited.

(Stand No. 86.)

In a specially-designed stand, daintily decorated—the partitions being covered in green sateen, and facias of plush (with silver padded letters) supported on decorated uprights, and festooned with amber plush curtains and valance, the United Kingdom Lighting Trust, Limited, are exhibiting patent reflectors (known generally as the "Multiflector" system) for increasing the light of burners without in any way augmenting the up-keep cost. There is novelty here worth inspecting. The reflectors can be fitted to



TWO-LIGHT PENDANT.

Fitted with one diamond-shaped reflector, which increases the light 50 per cent. in the required direction.

SINGLE-LIGHT BRACKET.

Fitted with two-wing reflector, which increases the light 100 per cent. in the required direction.

any existing burners, or fittings are supplied complete with them. There are several forms of them, adapted both for outdoor and indoor illumination. One form is a diamond shape reflector, which is reputed to increase the light by 50 to 75 per cent. in the required direction. In using clusters of mantles for street lighting, it is pointed out that there is light lost between the mantles; but the rays of light so lost are, by means of this reflector, thrown directly up and down the street. Wing reflectors for fitting on to brackets are credited with increasing the light 100 per cent. in the required direction. Photometric tests show that the new three-way burner gives a light of 295 candles when used with the reflector named above, compared with 183 candles without it; the "Diamond" reflector fittings (with two ordinary "C" burners), 218 with, 147 without; and the two-wing reflectors joining, 295 with, and 145 without.

Mica Boiler Covering Company.

(Stand No. 105.)

This Company have on show their special covering for boilers, steam-pipes, hot and cold water pipes, refrigerating plant, &c.; also their flexible removable flange covering for steam plant. The Company particularly draw attention to the fact that their coverings are a unique departure from all other modes of covering steam plant, inasmuch as they utilize for the purpose a material which has not hitherto been considered practicable—viz., mica flakes. Mica as a non-conductor of electricity is, of course, well known, and also its probable value as a non-conductor of heat. Hitherto, however, the use of mica has been confined to ground mica, mixed with an adhesive material; and it was found that this composition was little, if any, better than the ordinary asbestos compounds. The Mica Boiler Covering Company, after long and expensive tests, found that the highest results in non-conductivity were obtained by the use of mica flakes, not ground mica. By assembling these flakes together to a thickness varying according to the sizes of the surfaces to be covered, and so arranging the flakes in moulds that they lie in a concentric form round the pipes to be covered, the mica flakes act as baffles to the escape of the heat, with no fibres intermixed with them to conduct the heat out, as is the case in many other materials. They also found that, by crimping each flake of mica, they thereby imprison a tremendous amount of heat in the covering, so that, by the combination of baffle flakes and dead air, they have, they assert, an almost ideal covering. By putting this covering through another process, they found that the material can be rendered insoluble in steam, water, and acids. They are said to be entirely unaffected by exposure to damp. The Company also draw attention to their removable flange covers. They are of flexible form, and made entirely of mica flakes stitched between galvanized wire netting with wire; and so may be removed as often as is necessary, or dropped from a height without detriment to them. For superheated steam, the coverings appear to be peculiarly adapted, as the assurance is given that, under high heats, they improve rather than deteriorate. During the course of their manufacture, their sections are subjected to a heat of from 800° to 1800° Fahr. To gas engineers with their large battery of boilers, and other steam users, mica coverings must appeal for consideration.

Sheepbridge Coal and Iron Company, Limited.

(Stands Nos. 115 and 146.)

The Sheepbridge Coal and Iron Company, Limited, whose works are in the vicinity of Chesterfield, exhibit a number of specimens of their various manufactures. The firm have been engaged in the production of iron and coal for nearly half-a-century, but within recent times have largely extended and modernized their plant. The portion of their exhibits which will particularly demand the attention of gas engineers and managers consists of samples and sections of cast-iron gas and water pipes, and specimens of cannel and other gas coal. Gas and water pipes—although a comparatively recent addition to the manufacturing processes of the Company—are by no means the least important of their productions. The foundries in which pipes are manufactured are, we learn, fitted with every modern appliance for the saving of labour and for the expeditious out-turn of all sizes of pipes up to 60 inches in diameter. Samples of pipes up to 36 inches in diameter are on view at this stand.

Before passing to the coal exhibits, we may refer to the excellent samples of Derbyshire pig-iron which appear on the Company's stand. Gas managers, of course, realize that the excellence of the pipes they use must largely depend upon the quality of the pig-iron employed in the foundries; and they will, we think, agree that, both as to fracture and analysis, the samples of "Sheepbridge" pig-iron leave nothing to be desired. General castings are also in evidence, in the shape of tunnel lining plates (of which many thousand tons have, we are informed, been supplied to the various Tube Railways in London), wheels, retort-castings, &c.

A large variety of sections of rolled wrought iron is on view; and examples of the various tests and strains to which Sheepbridge manufactured iron have been subjected may also be seen. A fractured specimen of round iron made for the British Admiralty, and now exhibited, required a tensile strain of no less than 137 tons to break it—the diameter of the bar being only $2\frac{3}{4}$ inches. Samples of light iron sleepers made by the Company are also shown, together with specimens of steel rails for light traffic.

Turning now to the Company's coal exhibits, it may be remarked that the annual output of the Company's collieries is about a million tons. Some 2500 men are employed in bringing this quantity to the surface and loading it for the market. The Company are also joint owners of other collieries the output of which is not included in the above figures. Attention is particularly directed to the sample of Glapwell cannel—a coal of remarkable illuminating power—giving, it is said, "a light of 33-candle power, while at the same time the volume of gas per ton of coal is fully up to the average." One other sample of ordinary gas coal is exhibited—viz., Glapwell hand-picked bright gas coal.

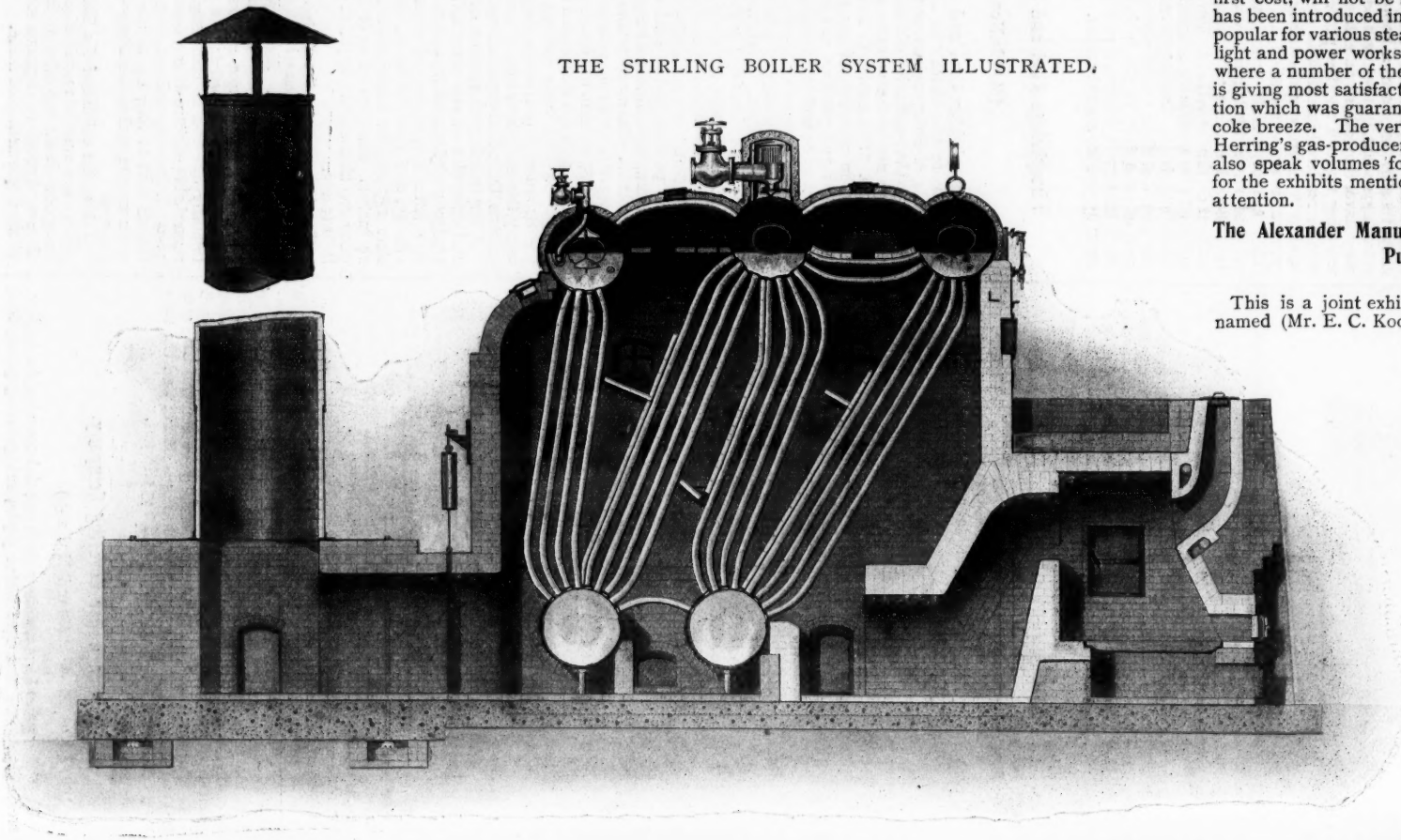
Taking the exhibit of the Sheepbridge Company as a whole, it will we are sure be regarded as an excellent example of what is being done in the way of providing the gas engineer with the heavier classes of goods he requires in the manufacture and distribution of his staple article of trade.

Stirling Boiler Company, Limited.

(Stands Nos. 116 and 145.)

A very interesting exhibit is being made by the Stirling Boiler Company, Limited, of No. 25, Victoria Street, Westminster. They show a working model of their standard boiler, and a sectional model of a "W" type boiler. The Company are making special efforts to interest gas engineers in the operation, resulting duty, and the advantages of this type of boiler; and they could not have taken a more effective course for doing this than to show the sectional model, which explains exactly the construction of the boiler. The working model illustrates very clearly the circulation of the water in the boiler; but, while simple in construction, the latter is somewhat difficult of description. The feature to first attract attention is the peculiar setting of the four ranges of tubes. They are inclined; and the nearest approach to their appearance is a large italic *W*. Superposed above these four ranges of tubes are three drums, set at slightly different levels. The inclined tubes connect these with two mud drums at the base; and all the series of drums are connected together by short curved tubes. The water is taken in at the coolest part of the boiler—that is, at the top of the rearmost drum; the furnace being situated at the other side. The water passes down the back row of tubes into the first mud drum; and, in this first part of its travel, it relieves the escaping furnace gases of their last available heat. In the first mud drum, the mud and scale forming constituents contained in the water are deposited. The water then passes over to the lower front drum, and afterwards gets into the general circulation of the boiler where the heat is greatest, and steam is generated. The circulation of the water is very rapid; the increase in the rate of speed being very much in relation to the temperature of the gases by which the various banks of tubes are surrounded—the greater the temperature, the greater the rate of travel. The steam is taken off at the top of the middle upper drum. The back part of the boiler acts both as a heat economizer and a purifier; but should any scale be formed, the Company have produced a very ingenious tube cleaner, which is rapid and perfect in action. Tube repairs are also easily effected. Spare straight tubes are supplied, which can easily be brought to the requisite shape by means of a bending block. Altogether, we think the claims of the Stirling boiler to be an economical and effective steam raiser, and comparatively cheap in respect of first cost, will not be found to be exaggerated. Since this boiler has been introduced into this country, we learn that it has become popular for various steam-generating purposes, notably for electric light and power works; and we are informed that in one factory where a number of the boilers are at work, ordinary coke breeze is giving most satisfactory results—in fact, the amount of evaporation which was guaranteed with good coal has been attained by coke breeze. The very good results, it may be added, from Mr. Herring's gas-producer at the Granton Gas-Works at Edinburgh also speak volumes for this boiler. These remarks will secure for the exhibits mentioned in the opening lines a fair share of attention.

THE STIRLING BOILER SYSTEM ILLUSTRATED.



The Alexander Manufacturing Company—The Mork Patent Pulley Block Company.

(Stand No. 112.)

This is a joint exhibit by the Manager of the two Companies named (Mr. E. C. Koop). The Alexander Manufacturing Company are showing cast-iron cocks and valves, for gas, water, and steam, flanges and spanners, parallel and tube vices, and screwing-machines. The Mork Patent Pulley Block Company are exhibiting worm-geared pulley-blocks, both with and without quick return gear, and runaways; the pulley block with the quick return gear being their "Mork" patent pulley block.

Voelker Incandescent Mantle, Ltd.

(Stands Nos. 114 and 147.)

These stands, which, as in several other cases, are really combined in one, will probably prove more attractive to the ordinary visitor than to the gas engineer or manager, inasmuch as there is shown the process of making the framework of the mantles supplied by the Company. A young lady attends to the machine which weaves the fabric, while others do the finishing off. The three sides of the stand are lighted on the outside by a line of the Company's "Solvo," "Neptune," and "Saturn" lamps.

The Oliver Typewriter Company, Limited.

(Stand No. 106.)

In these days of high-pressure business, the typewriter has become a necessary adjunct to office equipment. Gas managers and secretaries consequently find that they have to go with the times, and adopt the best methods of disposing of their correspondence expeditiously. Their attention may therefore be usefully directed to the exhibits of the Oliver Typewriter Company, who are the official shorthand writers and typists for the exhibition. They are showing their standard instrument, which writes 96 characters (12 more than the usual number), and has been designed specially for the use of engineers, architects, merchants, and others who require a large number of special signs, such as fractions, in addition to those represented on the ordinary keyboard. This can be arranged so as to allow of one or more foreign languages to be written besides English; and, further, the writing is visible while in progress. Tabulated statistics, which are so frequently employed by gas managers, can be easily produced, including the ruling of the columnar and head lines, by the machine. The Company also show their rotary duplicator, and suitable tables, chairs, &c., for the use of a typist.

Messrs. Rotherham and Sons.

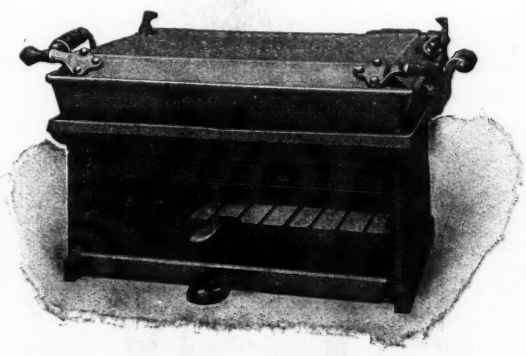
(Stand No. 108.)

The collection of small but useful articles required about gas-works and the distribution system which Messrs. Rotherham and Sons display cannot be singly described. They comprise a general assortment of bye-pass cocks and wrought metal taps, unions, lubricators, and grease-cups; perforated metal work; small accurate wheel and pinion work; and a variety of small parts suitable for gas engineers. A special feature is a patent monetary change-giving appliance, applicable to prepayment gas-meters. The great saving of expense in collecting the cash from penny-in-the-slot meters fitted with this device will be apparent when it is seen that the money is collected in sixpenny pieces, instead of in coppers. This is an exhibit which will attract the attention of those who make a study of economy in the prepayment branch of their business.

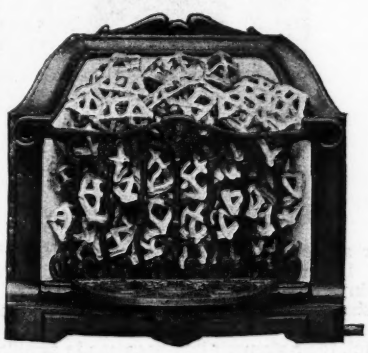
The Carron Company.

(Stands Nos. 109 and 151.)

Some of the special lines of goods as manufactured by this well-known Scottish house and shown on their exhibition stand



are: (1) The "Carron" "Cupid" gas griller. This has double deflecting plates and rising and falling movement. The hob is easily removed by releasing one screw—giving free access to the burner and deflector for cleaning, reversing, or repairing. Its size is 11 inches wide by 9 inches deep and 7 inches high. (2) The



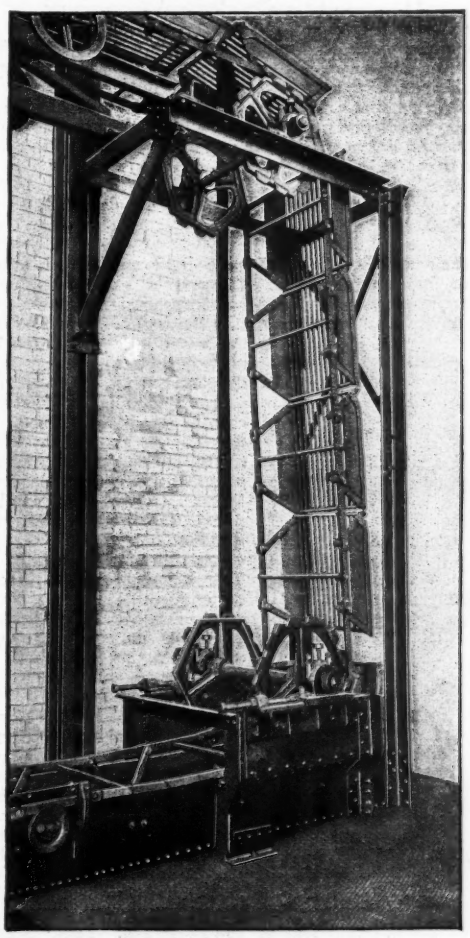
"Carron" No. 512 gas-fire, which is easily fitted into existing fireplaces of ordinary register grates, &c. It is made in three widths—13¾, 15¾, and 17¾ inches by 15¼ inches high and 6 inches deep. (3) The "Hygienic" induction condensing gas-stove. Here

no flue is required. It is made in two sizes, and is supplied in various finishes.

Mr. F. D. Marshall.

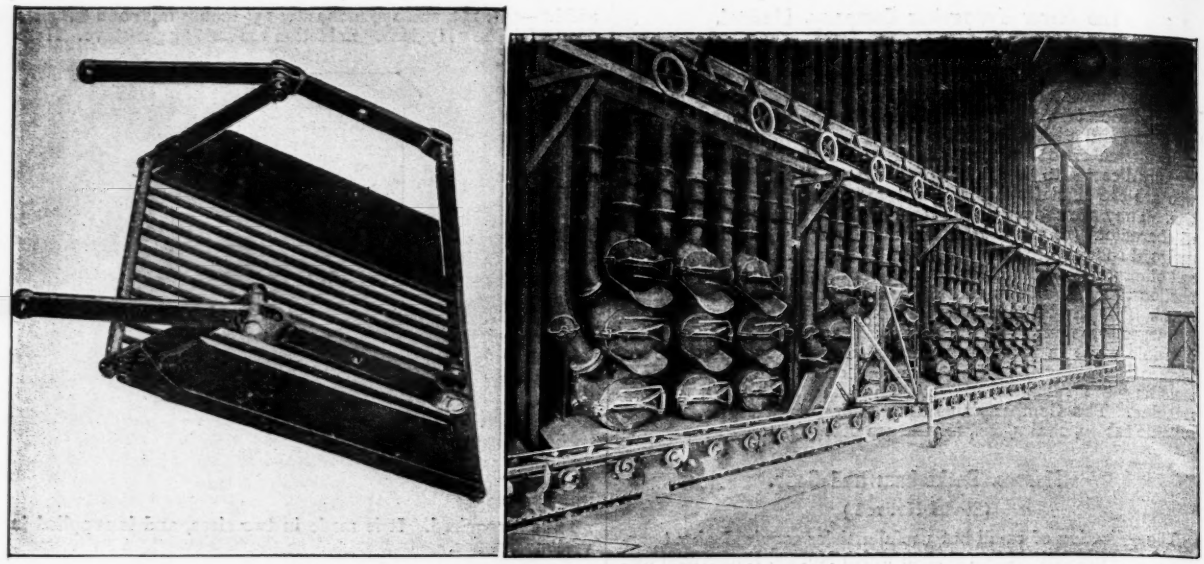
(Stand No. 110.)

Part of the above stand is occupied by a working model of Mr. Marshall's patented grille or grid hot-coke conveyor. The scale of the model is ¼ inch to the foot. When designing this form of conveyor, Mr. Marshall sought to remedy what he



F. D. Marshall's Grid Hot-Coke Conveyor.

regards as the drawbacks attending the usual form of push-plate or drag-bar conveyor; inasmuch as the coke is carried on a series of baskets formed of bars or rods suspended either just in or just above the water in the trough as the case may be. The advantages of this form of conveyor are that the coke is carried quite undisturbed, and the water used for quenching purposes



F. D. Marshall's Grid Hot-Coke Conveyor.

is allowed to pass through the bars or grids which prevents the coke from becoming sodden. The trough too is novel, as it is fitted with a series of bye-pass channels by which the water used for quenching purposes, after being pushed forward by the coke and conveyor—instead of passing away through an overflow—returns behind the coke which is being carried forward, and so is used over and over again. The bye-pass channels are specially constructed so as to be easily cleansed from accumulations of breeze and detritus.

The conveyor is said to be working successfully at the Aalborg works of the Danish Gas Company. The illustrations appended show the conveyor in action; likewise the elements of which it is formed. The Licensees on the Continent are the Berlin Anhalt Company; and in America, Messrs. Bartlett, Hayward, and Co. Mr. Marshall has not yet made any arrangements as to Licensees in this country.

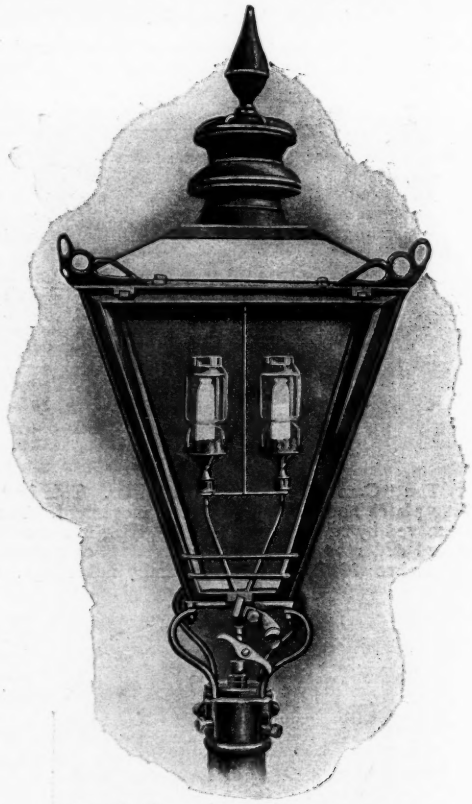
Messrs. George Bray and Co. Limited.

(Stands Nos. 120 and 141.)

At their stands, Messrs. George Bray and Co., Limited, are showing that, no matter what character of gas is being used, nor what are the requirements of the consumers, they are willing and ready to supply what is suitable in the way of burners. Whether the need be a flat-flame burner, an acetylene burner, or an incandescent burner, types of all kinds and of a high degree of excellence can, it is demonstrated, be obtained from them. Looking first at the flat-flame burners, it is impressed upon the inquirer that Messrs. George Bray and Company's factory is the "only one making complete non-corrosive gas-burners in all their parts." The burner tips, too, are made of enamel. Here we have the whole range of these burners exposed for inspection, bearing names which are as household words—the "Special," the "Adjustable Special," the "Regulator," "Bray's Gas Economizer," "Non-Regulator," "Rattail," "Sunlight," "Oven," "Railway Carriage," "Geyser," "Market," and the "Standard." The "Standard" burners are interesting, from the fact that they were introduced in February, 1879, to complete for street lighting with the electric light. Before their introduction, there were no slit union burners which yielded more than 14·8 candles per 5 cubic feet of 16-candle gas. The "Standard" burners, however, give a light of 17 candles per 5 cubic feet of 16-candle gas; and maintain this power through consumptions of 8 to 25 cubic feet per hour.

The Bray Incandescent Burner.

Coming to the incandescent gas lighting department, the Bray incandescent burner, with adjusting screw, and with inside bye-pass, is worthy of consideration. It is a low-priced burner; and we have heard it highly spoken of. It is constructed with a non-corrosive burner head, combined with a patent spring clip for the mantle-rod, and is fitted with a solid brass gas-nipple. The lighting efficiency is reported as equal to 25 candles per cubic foot of gas consumed; and the efficiency is maintained between the long range of 7-10ths and 30-10ths pressure. It is also noiseless, and can be turned down without lighting-back. Bray's incandescent burner adjuster is a device that should be looked into. By it, the user is able to adjust the gas supply to the burner at the nipple "without decreasing the gas pressure at the point where the gas enters the mixing-chamber." The adjustment should be made—according to the quality and pressure of the gas—after the mantle has been placed on the burner and lighted, until the best lighting result is obtained. The firm's incandescent ramie mantles have made good headway in popularity; and their performance can be judged at the stand.



Bray's No. 2 "Bagby" Lantern.

Another section of the exhibit are the Bray "Bagby" and "Exago" lanterns for incandescent street lighting, and are exhibited in various sizes for one and two burners. An examination will show that their excellent reputation is not ill-founded. They are made of tinned copper; and, while the design is light and tasteful, their strength has been made familiar by extended use. The lanterns are made to be suspended from the top, or by a waistbelt, or for use on a pillar.

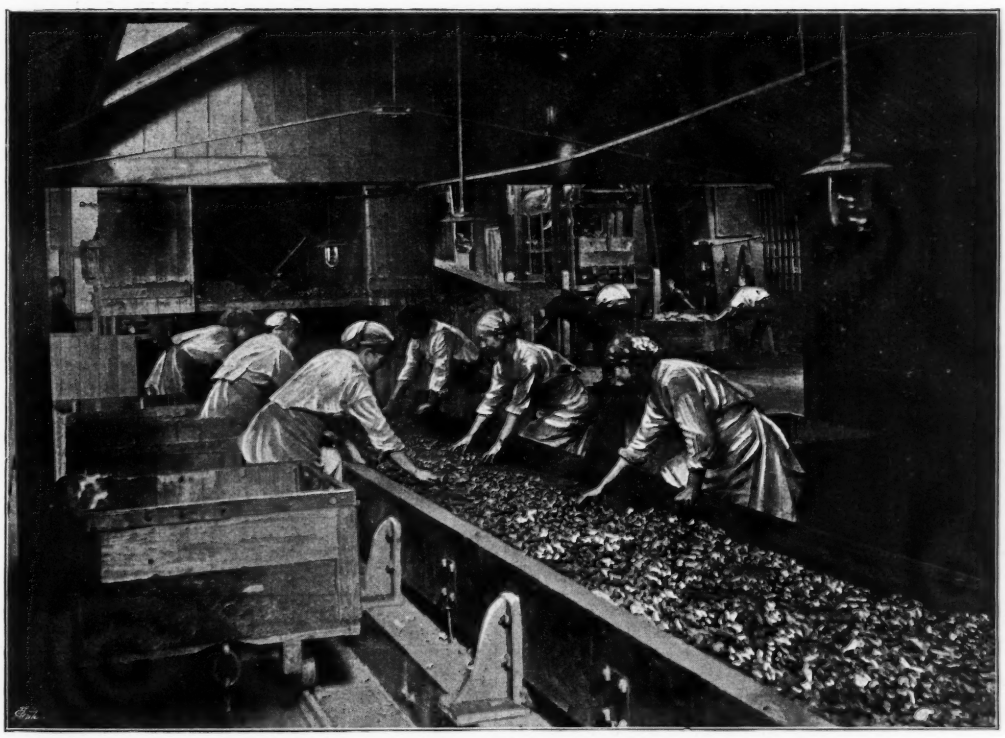
It must not be overlooked that the firm have been allotted a portion of the Queen's Palace annexe for general lighting.

Wigan Coal and Iron Company, Limited.

(Stands Nos. 117, 155.)

It is difficult to know what to say about the exhibit of this Company, except to congratulate them and Mr. A. C. Scrivener upon the excellent and interesting display they have made. It is an exhibit comprehending a great deal of first importance to the gas manager. There are a number of blocks of coal, which are not things that appeal to the eye like a brilliant light for example. Anyway, though the general public may not be attracted, the gas manager will be. There are four blocks of coal—one of Arley mine coal, specially suited for best house and gas purposes

Collier Holing.



Cleaning Fuel.

one of the Haigh Yard steam coal; one of Wigan cannel, for enriching coal gas; and one of Nottingham top hards, from the Manton Colliery, Worksop. It is also hoped to have a block from the Company's new collieries at the Dukeries. Graded sizes of coal are shown, for house fires and gas production, comprising lump, cobbles, large nuts, gas nuts, washed Arley nuts, washed Arley peas, slack, and screened cannel. On view, too, are briquettes, coke made from Semet-Solvay ovens and beehive ovens, and sulphate of ammonia and tar from the bye-product plant. In another section are some samples from blast-furnaces

and the Siemens-Martin Open Hearth Basic Steel Works, comprising—Ferro manganese, containing 40, 50, 60, 70, and 80 per cent. manganese, Spiegeleisen, containing 5, 10, 15, 20, and 30 per cent. manganese; Kirkless Hall forge, foundry, and basic pig iron; concrete flags, made from blast-furnace slag and cement; and broken slag for road macadam and concreting, and slag chippings for "racking." Steel is also exhibited in various grades of manufacture from the Company's own works and articles (kindly supplied by other firms as per labels) made from the Company's pig iron and steel.

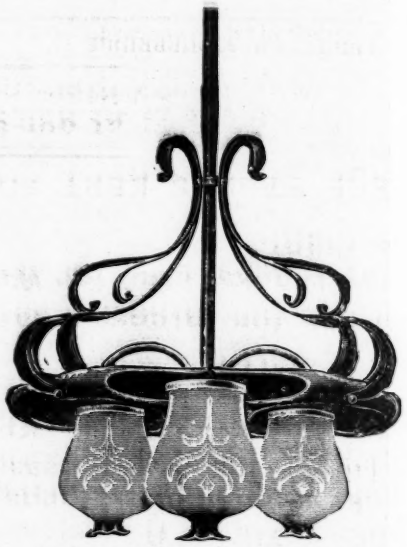
Messrs. Falk, Stadelmann, and Co., Limited.

(Stand No. 142.)

If success from an exhibition point of view depends on the locality of the display they make, then Messrs. Falk, Stadelmann, and Co., Limited, are to be congratulated on the position of their stand. It is situated in the centre of the Queen's Palace. No effort has been made, we are informed, to make the stall other than a distinctly commercial exhibit. Green canvas, in an art shade, is used as a covering, and a background and woodwork are painted *en suite*. A feature is made of the Company's large poster, entitled "Striking Facts," for advertising their well-known Veritas mantles. One of the special features of the Company's exhibit is, of course, the "Veritas" mantle. Excellent photos. have been taken of the "Veritas" Mantle-Works; and the mantle in its various stages of manufacture is illustrated. This should prove an interesting item, even to the lay mind. In a glass case, on one of the tables are shown the whole of the materials used in the various stages, together with the chemicals that go to make up the completed mantle. There are few firms so strong in glassware for the lighting trades as this one; and the whole range of gas glassware is displayed, together with the famous "Jena" specialities in chimneys, &c.

The "Veritas-Celestra" Lamp.

The firm light a considerable area of the Queen's Palace near their stand. This they do with twelve of their four-burner "Veritas-Celestra" lamps and six of their "Veritas-Pharos" lamps. The former is illustrated. This lamp is fitted with four "Celestra" burners, and has many new features about it—perhaps one of the most important being the method of manufacture, whereby exposed screws are done away with, making the renewal of the outer casing—so often a necessity, and always an inconvenience to maker and user alike—unnecessary. As so many high-pressure systems of lighting are in use at Earl's Court, perhaps it is necessary to say that Messrs. Falk, Stadelmann, and Co.'s lamps are all working under ordinary pressure. In addition to the lighting already referred to, the firm are lighting a portion of the exterior at the upper end of the lake; and here they show—along with a series of lamps—various forms of their "Municipal" taps and lighting apparatus. One of the taps, with travelling jets, and special torch for street-lamps, is illustrated These taps make the use of the bye-pass unnecessary. Westenholz's patent automatic gas lighter and extinguisher is made a special feature of the exhibit. A detailed notice of this interesting apparatus has already appeared in the "Journal." Among the large range of street-lamps shown is the "Parade" lantern, which has found much favour among lighting authorities.



An Inverted Burner Chandelier.

An exhaustive range of fixtures for the inverted burner is also a prominent feature of their exhibits. This fitting is of iron and copper; and the burners are so arranged that the products of combustion do not soil the fitting. The copper reflector increases the light, and is so fixed that roof shadows common to all reflector pendants are broken up.

The Yorkshire Silica Fire-Brick Company.

(Stands Nos. 123 and 138.)

Retort-bench work has illustration here on this stand; a setting built after Paterson's plan being on view. In this, the Company's "S.P." silica blocks, containing 95 per cent. of silica, are used; the object being to demonstrate the advantage of using the blocks in combustion chambers. Another exhibit is "Silco" bricks (which contain 90 per cent. of silica), in the form of a retort, as these bricks, it is stated, are now being largely used for this purpose. Experience, it is further mentioned, shows the great advantage of using them in place of any ordinary fire-bricks round the centre retort, as there is no shrinkage; and therefore the sinking of the retort is prevented. These bricks are also useful for generator chambers and arches. The Company are also showing their "Holdfast" bricks, which are very serviceable for gas-works buildings, as the wood blocks which run through the bricks cannot possibly work loose.

Selas Light Company (Messrs. Bever and Wolf).

(Stand No. 137.)

This exhibit comprises a low-pressure apparatus ($3\frac{1}{2}$-inch water-pressure), actuated by a very ingenious and specially devised water-motor. This apparatus is useful for private dwellings and small establishments where flames of 25 to 200 candle power are required. The consumption of the burners commences with $1\frac{1}{2}$ cubic feet of gas per hour. The water-motor works practically without attention, and is fed from the common house water-service. The second exhibit comprises an electrically driven turbine machine, which, after the air and gas are mixed in proper proportions, raises the pressure to 10 inches of water. It is suitable for flames of 25 to 800 candle power. Where a current of electricity can be obtained, this is a specially unique and cleverly designed apparatus, working noiselessly and without attention, beyond occasional lubrication. The third exhibit is on the high-pressure system, in which a mixture of air and gas is consumed under a pressure of 32 inches of water. This apparatus, comprising a compressor and mixer, is suitable for flames of 25 to 2000 candles; and it is claimed for this apparatus and system that a result equal to 45 candles per cubic foot of gas consumed can be obtained.

A section of the exhibition is lighted by this system; the stated power of the flames being 1000-candle power each, with a consumption of gas of 25 cubic feet per hour per burner. We learn that many installations of the "Selas" system are now working on the Continent, and several in England.

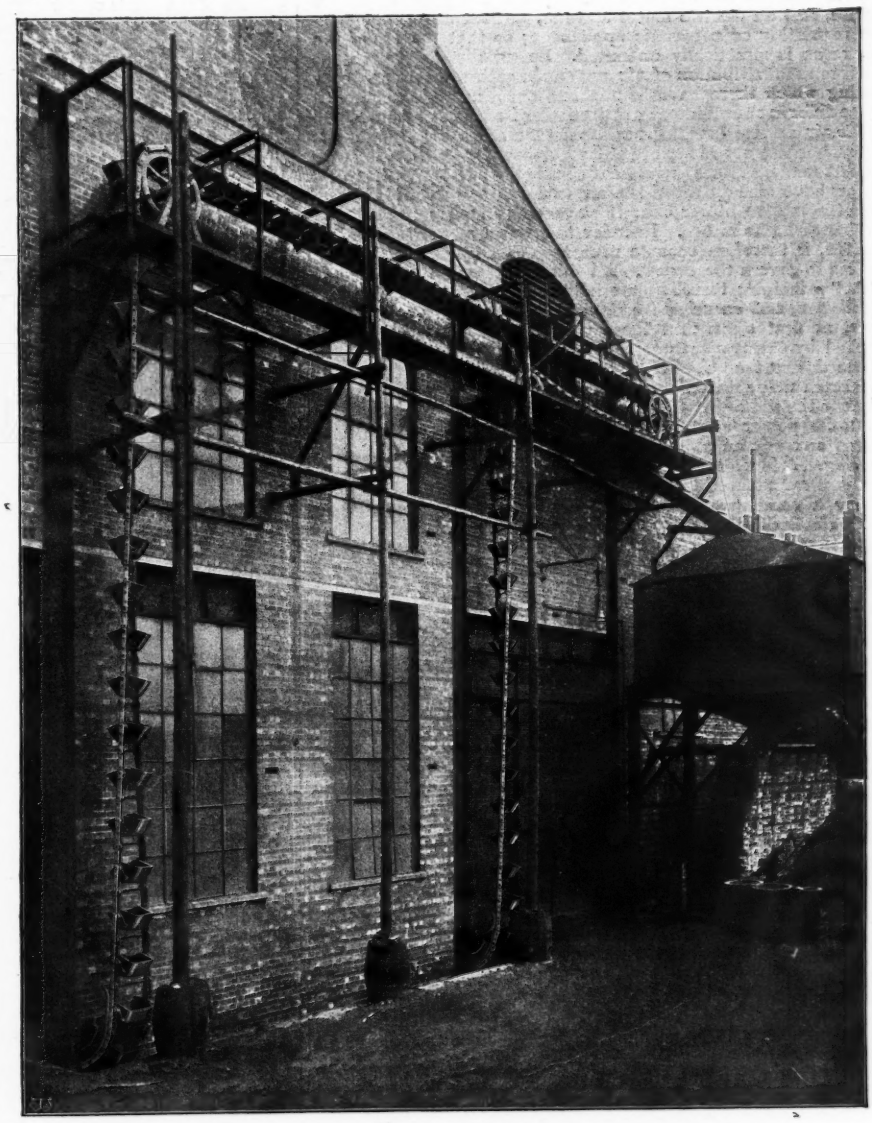
Messrs. Babcock and Wilcox, Limited.

(Stands Nos. 122 and 139)

Giving first a synopsis of the exhibits on this stand, we have: (1) The Company's "Silent" gravity bucket conveyor, for conveying coal, coke, ashes, ores, and macadam, &c., and consisting of the following parts: Driver in motion, showing the method of working the conveyor without sprocket wheels; automatic filler for conveyor buckets; and arrangement of buckets, chains, &c., with rails, supports, and dumping or discharging appliance. (2) A model of a patent water-tube boiler, suitable for all industries employing all kinds of fuel and refuse. (3) A model of mechanical chain grate stoker for burning low-grade fuels smokelessly. (4) A model of water softening and purifying plant (Guttmann's patent) for eliminating the hardness from water before it enters the boiler; thus keeping it quite free from scale, and obtaining the highest efficiency. (5) A "Turbine" tube cleaner for removing the incrustation formed inside the boiler, economizer, or other tubes. (6) Specimens of wrought steel steam-piping.

In view of the adoption of the Babcock and Wilcox gravity bucket conveyor at the Provan Gas-Works of the Glasgow Corporation, we may take this opportunity of giving it a rather more extended reference than has yet been done. In its present form, it is the outcome of many years' practical experience and close observation, careful design, and study of details, resulting in an economical expenditure of driving power, and the production of durability, general simplicity of working, and control. The low driving power has often been commented on; but, when it is considered that the bucket and chain mechanism is absolutely balanced, and entirely carried on well-lubricated bearings, and that only the mechanical equivalent of the material raised, *plus* the horse power required to drive the chain, has to be calculated, the efficiency will be better understood. Another feature in the conveyor, which contributes to this result, is the pawl driver. The pawls drop into position on the chain at the correct points, and thrust forward the two sides simultaneously. Before the pawl leaves its position on the driving-stud of the chain, it recedes to a considerable extent from it; so that no friction is experienced in withdrawing the pawl from the chain, and, over and above this, the withdrawal leaves a very considerable latitude for wear in the chain, without in any way affecting its efficiency, or that of the driver. Another noticeable feature is the application of free or revolving curves where the direction of the conveyor is changed, either from the horizontal to the vertical in the same plane, or at any angle to the first plane of motion. In descending from an upper run to any depth, the maximum stress is at the point of turning to descend. Here the wheels carrying the chain and buckets cease to rotate as soon as they touch the revolving free-wheels; and, when movement ceases, friction also ceases, and, consequently, wear on the chain, wheels, and axles. The power required to drive the conveyor can be easily estimated with fair exactitude, and should be taken as made up of two parts: First, the power to drive the conveyor empty; and, second, the power required to raise a certain weight of coal per minute through a given height. Experiment has decided the first; and the second, as already stated, is the mechanical equivalent of the work done. The small power required to drive the conveyor has frequently been the subject of remark. The conveyor is automatic in its cycle of action; no handling being necessary after the material is delivered into the receiving-hopper.

As to the general construction of the conveyor, the buckets are of mild steel stamped out of one sheet, and have each a pair of combined cams and trunnion bearings of malleable cast iron strongly riveted on, and formed so that a bucket can be detached in a few seconds without disturbing any other parts of the conveyor. The chain consists of two double-link chains, each link made of flat steel, and steel stud-rivets forming distance-pieces for the pairs of links. The chain wheels are made of special close-grained cast iron, accurately bored for the axles, and have recesses in the bosses for the reception of a clump of special fibre, which, by capillary attraction, retains enough oil to supply lubrication for considerable periods. The oil is supplied through special spring-top brass lubricators inserted in the wheel bosses, which exclude dirt. The process of dumping or tipping is effected by a pair of cams carried by a cross-shaft coming into contact with another pair of cams riveted on the ends of the buckets, and causing them to tip up at an angle sufficient to completely eject the contents. These dumpers can, of course, be applied at any points of the horizontal runs, and the brackets are clamped to the track rails by hook bolts, enabling them to be easily shifted if necessary. The movement of a hand lever to the right or left will engage or disengage the dumpers. The filling mechanism consists of a series of (seven) hoods, with openings corresponding to the pitch of the buckets, delivering certain quantities of material into them. These hoods are all of them hinged and connected in the form of an endless chain, and carried on wheels running on a suitable track constructed in the filler-frame. The filler-chain is driven direct by the conveyor chain engaging with projections or teeth on the former. The fillers are of two kinds—stationary and portable. The former is used when filling is done at one point only; and the second, or portable, when coal is retrimmed from storage bunkers to the other bunkers, and also when ashes are filled from ash pits where considerable quantities can be stored. This portable filler travels on independent rails, and can be traversed to any position on the rails to receive coal



Silent Gravity Bucket Conveyor at the Oldham Electricity Works—Capacity of 20 Tons per Hour.

(The illustration shows the flexibility of the conveyor in the vertical plane.)

or ashes, and is clamped down before commencing to work. Both kinds are operated by the conveyor chain engaging with sprockets, or projections, on the filler-chain, which carries a series of hoods around a track; these hoods successively covering the buckets, and fill them without spilling. The guide-wheels take the place of the rail track at the curves or points where the direction of the conveyor is changed, and revolve on an axle running in ample bearings, automatically lubricated, and, as previously described, save movement of the chain wheels at the points of maximum stress—in fact, forming a revolving, instead of a fixed, track.

Air Light Company, Limited.

(Stands Nos. 121 and 140.)

Here the visitor is introduced to a system the object of which is to produce "the highest illuminating value in gas, combined with such simplicity that the installation may be left to the most ignorant attendant." This looks most attractive. The appliances used are merely the ordinary gas service, a supplementary air service, and an electric motor and fan, without any supplementary regulating or automatic appliances; so that the life of the apparatus is practically unlimited. Essentially the apparatus involves the distribution of air and gas in separate services, concerning which there have been taken out a number of patents. These differ in one all-important particular from air light, inasmuch as the air service is entirely without regulating devices—that is to say, burners out of use are still receiving air which passes into the surrounding atmosphere. Previously the taps which operated the gas have also operated the air to the burner; thus throwing upon the motive power conditions varying in proportion to the number of lights in use. In order to prevent other lights being affected, it therefore became necessary to introduce regulating devices to govern the motor. All this is eliminated in the "Air-Light" principle; thereby materially reducing the initial cost of installation, and ensuring freedom from breakdowns. It might seem, at first sight, that these very desirable conditions are reached by extravagant waste of power; but it is found, we are informed, that the power required under the "Air-Light" system is so small that a dozen burners of 500-candle power each would only use the same power as that necessary for running a single 16-candle power electric incandescent lamp. To attempt to govern so small an amount of power would, of course, be hair-splitting. A further advantage in "Air-Light" is that the air distribution machinery is the simplest conceivable. It is in reality merely a ventilating-fan driven by a small electric motor, or, where electricity is not available, a water-jet operating a Pelton wheel would drive the fan. The air is supplied at a very small pressure; so that no governing or other complex device intervenes between the burners and the motor. This system commends itself especially to places where a dusty atmosphere prevails, as the air may be drawn from outside the building, thereby delivering pure air to the mantles. The mantles out of use are also protected from the settlement of dust, and the burners are kept clean, by the constant outflowing of pure air driven by the fan. The distributing air-ducts, although comparatively large, are by no means expensive. The lightest construction of zinc tubing, or even prepared canvas, may be used, as pressure cannot be said to exist, and a certain amount of leakage is immaterial. Another important point put forward in its favour is that for insurance the system commends itself, as "it gives the same high efficiency as gas under high-pressure, while no necessity exists for anything more than a normal gas-service." Regulation is essentially easy, too, as, the air-flow being constant, it is only necessary to turn on the gas supply as in a flat-flame burner, the eye readily discerning when the maximum illumination is given by the mantle. Thus the gas-service may be at a pressure too low even for effective use in low-pressure lighting; yet this would present no obstacle to the introduction of "Air-Light." Although the air-ducts are comparatively large where a number of lamps have to be supplied, it will be noticed that, at the point where the gas is consumed, the capacity of the pipe is so small that nothing unsightly is necessary. In fact, the casual observer would detect no difference between the "Air-Light" and ordinary gas-fittings.

There is on the stand a machine called the "Permetor," and which delivers air and gas in the proportion of two of the former to one of the latter. The method of production of the mixture by the machine is unique in its simplicity. The results are secured by simply reciprocating an inverted bell in a liquid seal, preferably oil, and transferring the motion to it through a shaft, which carries a regulating-sleeve. This sleeve works within a main casting, and synchronizing with the movement of the liquid cylinder, it alternately opens the connection with gas and air; so that the cylinder, on the suction stroke, receives air for one-third of its travel, gas for another one-third of its travel, and for the final one-third of the stroke air again. Thus a sandwich of air and gas is produced within the cylinder, which is further mixed during the ejecting stroke of the piston. Therefore, beyond the revolving sleeve and the reciprocating cylinder, no other appliances are necessary, except a storage tank usual with all compressed gas systems. The motive power may be electric, hydraulic, hot-air engine, or any other method suitable to the special circumstances under consideration. The control of the apparatus is quite automatic—the tendency of the machine being always to keep the storage tank charged; and when this becomes depleted by the mixed gases being partially used up, the machine is automatically set in motion once more.

Messrs. Biggs, Wall, and Co.

(Stands Nos. 125 and 136.)

On these stands are exhibited several of Messrs. Biggs, Wall, and Co.'s well-known specialities. Among them are two sulphate saturators, one of solid lead (the firm's own manufacture), fitted with pitch-pine lagging, and made throughout of pure chemical lead an inch thick. The solid lead saturators are fitted with lead catch boxes, to prevent any acid being carried over by the spent gases, as this has a tendency to destroy the tubes of the water heaters and condensers. Serrated trays are used in the still for distilling crude ammoniacal liquor; and these trays present several points of novelty. All the trays are machine faced; thus ensuring a thoroughly sound joint, both for gas and liquor. By increasing their number, the working capacity of the still can be greatly added to at a merely nominal cost. All joints, too, being machined, the trays can be removed, cleaned, and refixed in a very short time.

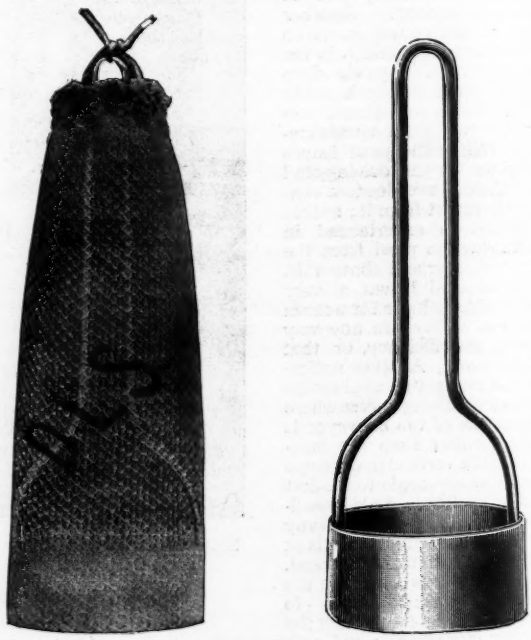
Two of the firm's retort-charging machines next fall for inspection. These machines have been so uniformly successful, even in small works where only one man is available, that a detailed description is unnecessary. A power machine, driven by endless rope, is also noticed.

Several very handsome lamps are shown. The framework carrying these lamps was specially designed for the exhibition, and is a credit to the designer, and their workmen. Several excellent photographs of work executed by the firm are on view, notably views of the methane hydrogen plant lately erected at Truro; and this new departure in gas making will prove of great interest to many engineering visitors. Other exhibits are cast-iron pipes, in 13 feet lengths and from 4 inches diameter upwards, gas-tubes, tools, &c.

The Dewey Lighting Syndicate, Limited.

(Stand No. 126.)

Here we have a decided novelty in the shape of a mantle-fitting. In the first place, the mantles are made of a three-ply ramie silk, and are themselves said to be as strong and durable as mantles can be made. But the most striking feature about these mantles is that each one (by the way, they are known as the "D. L. S." mantles) is fitted with the Dewey patent attachment, which consists of a band about $\frac{5}{8}$ inch deep, made of incombustible material, to which are attached two upright cords, which in turn are fastened to the loop at the top of the mantle, as shown in the illustration. This band is sufficiently large to hang loosely over the burner-head; and the attachment is so shaped that, when

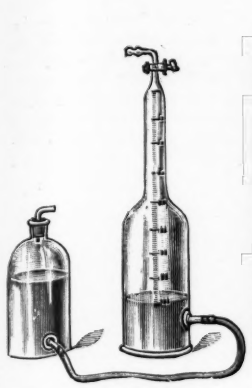


contraction begins, the mantle creeps automatically, and, it is pointed out, adjusts itself to the band at the base, which thus forms, in conjunction with the cords, a natural support to the upper part of the mantle. "The mantle for this reason does not break off at the shoulder; and the band round the base acts as a buffer between the burner head and the soft and fragile ash." It is, of course, matter of common knowledge that, in street-lamps, shops, and other places where a great deal of vibration exists, causing the mantle to oscillate on the prop, the mantle in a very short time wears away against the burner-head, and assumes a bell shape and ragged appearance. This, it is claimed, the Dewey attachment will obviate; and the mantle will last until it is quite exhausted.

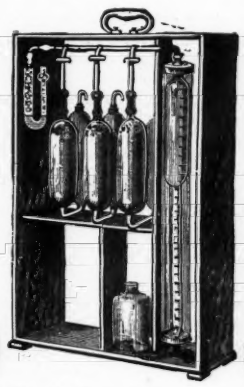
Messrs. Townson and Mercer.

(Stand No. 127.)

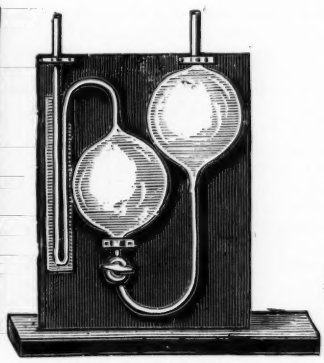
Messrs. Townson and Mercer are displaying scientific apparatus for testing gases which will claim the attention of gas engineers and managers and chemists. The most up-to-date apparatus for testing water in tar, flash-points, &c., can be seen in all but working order; but their uses, &c., can be readily and thoroughly explained. Among the apparatus, the following are particularly worthy of note: The Orsat apparatus for testing gas, which is being employed in many gas-works for testing flue gases, having the advantage of testing for carbonic acid, oxygen, and carbonic oxide. Its simplicity makes it very popular. The apparatus shown for testing water in tar is claimed to be a great improvement over all others; the condensers used being a new improved form, and distilling the most minute particle of water. Next are seen Bunsen's specific gravity tubes for taking the gravity of gases by passing them through a small hole in a platinum disc; the flow varying inversely as the square root of their densities. This apparatus is valuable for ascertaining the necessary diameter of mains for distributing the gas. The calorimeters on view are various; and each seems to possess some good quality. Among them are noticed the William Thompson type, which is a simple form, and has been, we are informed, largely adopted. A number of other appliances are shown, much too numerous to mention. The firm inform us that they have had to establish a special department for gas apparatus, as of late years such progress has been made in gas testing that it was absolutely necessary to be right up to date; and to be so, special study must be made of all suggestions. It seems clear, from what the firm show, that a complete laboratory for gas testing throughout can nowadays be fitted up, at reasonable cost, with the most modern appliances.



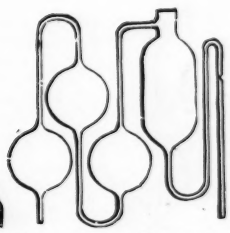
Greville Aspirator.



Orsat Gas Apparatus.



Hydrogen Pipette.



Absorption Pipette.

Rudorff's Apparatus for Determining Carbon Dioxide by Titration.

Briquettine (Minerals Binding) Company, Limited.

(Stand No. 128.)

The question of the most profitable disposal of coke breeze is brought before the gas manager at this stand; and he will be informed that it is to be found in its utilization in making up briquettes. Briquette making has not "taken on" much in this country at gas-works, but perhaps "Briquettine" may make the managers look upon this branch of business with a more favourable eye. "Briquettine" is the patented binding material for coal dust or coke. It will be remarked that the fuel made by it is bright looking and exceedingly hard, and is not liable to breakage on being carted or thrown about. The briquettes are clean to handle, and are waterproof. The chief features, however, of briquettes made with this binder are "hardness during burning, absence of smell and smoke, and great calorific value." The binding medium contains no pitch, tar, nitrates, or any substance which might lead to spontaneous combustion.

The British Compressed Gas Company.

("The Millennium Light.")

(Stands Nos. 129 and 132.)

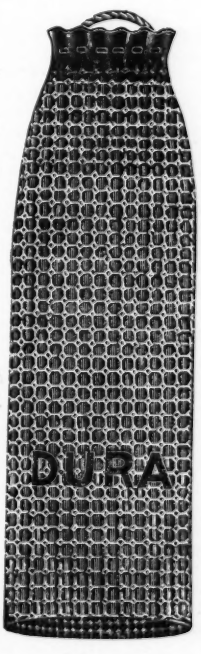
The British Compressed Gas Company are responsible for a good deal of lighting at the exhibition. At the main entrance, the design constructed by the Gaslight and Company is being lighted under the Millennium system; high pressure in this case being applied to ordinary and bunsen burners without mantles. The gas is being taken direct from the main, and put under an enormous pressure, and then burnt on the design, with the result that the varying flames necessary for producing the handsome design are secured. Every section of the design is under separate control. All this work, of course, has been carried out by the Gaslight and Coke Company; but the Millennium system is responsible for the pressure.

There are two plants driving from one 3-horse Dougill's engine standing in the entrance hall. The larger of the two is compressing for the Gaslight and Coke Company; while the smaller is lighting the Machinery Section, the Imperial Stove Company's stall in the Ducal Hall, and a section of the lighting by the lake. There has been no attempt in the Machinery Section to give more than an example of what the Company can do in the way of adequate lighting; and the same thing applies to the Imperial Stove Company's stand. Outside by the lake the lamps are not overcrowded, and are of the ordinary plain character used by the Company for their lighting in Berlin, and for Continental cities. These lamps will be controlled from several hundred feet away, so as to show gas managers how to dispense with the lamplighter. They are controlled, by the way, without any second pipe or any mechanical means other than the Company's high and low pressure valves. In the Queen's Hall, the Company have a stand with two plants upon it—one running from ½-horse power gas-engine. Here, again, there is no effort to display handsome lamps; the Manager of the Company having decided to deal more with the question of light values. On the stand of the Imperial Stove Company, however, there are three of the Company's brass lamps, which are, indeed, very handsome, and add greatly to the decoration of the stand. Photographs of the Aldwych (Strand improvement area) and other lighting are shown by the Company.

Guaranty Incandescent Mantle Company, Limited.

(Stand No. 130.)

Here we find an exhibit which is practically the same as that made by the Guaranty Company at the Ironmongers' Exhibition in July last; and it would indeed be difficult for them to vary it much. The materials from which mantles are made are shown; the celebrated ramie being an important feature. Commencing at branches of the ramie plant, the interested visitor is carried through the various stages of its development until the hank is obtained. Then come examples of the knitting machines that are used in working up the material into "stockings." One of the machines demonstrates the knitting of the double texture material, and the other instructs the visitor as to the high pitch of perfection to which mechanical knitting has been brought — this particular machine showing how it is capable of automatically changing from a fine to a coarse mesh, according to the length of stocking required. Photographs illustrate the chemical washing of the stockings for the purpose of removing impurities. The Company make in this country, and under direct supervision, the whole of their mantles from the hanks of finished ramie up to the completed article. Many of the Company's various types of mantle are specially made for street or domestic lighting; and these are shown alight and otherwise. The exhibit cannot fail to be interesting to gas engineers, dealing as it does with the complete production of such an important adjunct to lighting by gas as the incandescent mantle.



Messrs. T. S. Marriage and Co.

(Stand No. 134.)

A good general selection of the patent suspension lanterns of the above firm are disposed here for inspection. There are various designs, and the patterns are such as will appeal to those gas engineers who have been impressed with the necessity of assisting in beautifying the streets through the aid of the public gas-lamps and their fittings. The lanterns and the suspension devices are of a highly ornate description. The former, too, are shadowless; and this is a particularly good commendation in streets where the traffic is heavy. Furthermore, under similar circumstances, on account of these lamps being anti-vibrative in themselves, they do not require any special appliance or anti-vibrator in connection with the burner. The samples are arranged with single or cluster incandescent burners, of various designs, showing the adaptability of the lantern to the several types of burners now in general use. The lamps have also been adopted for the lighting of country districts and estates with petrol where gas is not available.

The Simms Manufacturing Company, Ltd.

(Stand No. 149.)

The Simms type of motors, fitted with the Simms-Bosch magneto ignition, with advance sparking, are on view here. These motors are supplied to consume petrol, petroleum, or coal gas, and are now in use for a great variety of purposes—including motors, bicycles, motor carriages, motor boats, motor lawn mowers, Spencer's airships, dynamos, pumps, and other portable and stationary machinery. Types are exhibited as prepared for these purposes. Examples and working models of the Simms-Bosch magneto ignition are shown. This method is now being used extensively on explosion engines of all kinds—from small bicycle motors to 100-horse power producer gas-engines.

Herr Jacques Kellermann.

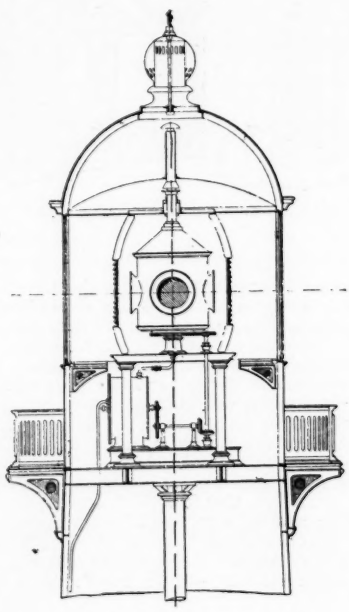
(Stand No. 131.)

On this stand are shown gas self-lighters, with and without smoke-preventers. The feature of the stand is the "Conus" self-lighter, patented by Herr Jacques Kellermann, of Berlin. The lighter is very simple in design—the igniting pellet being suspended in a fairly compact wire spiral running to a conical point—and is based on the principle of directly opposing to the flame gases as small a surface as possible (in this case the point of the cone only), and of turning aside laterally the hot gases of the flame by means of the oblique sides of the cone, and with them the products of combustion which are so injurious to the igniting pellet. It is claimed that in this way the light develops to its full power, mantles can be used much longer, and the puffing effect occurring on ignition with other kinds of lighters is quite impossible, owing to the small igniting surface of the "Conus." A further important advantage claimed for this lighter is its incombustibility, as its pointed shape renders completely harmless even sharp jet flames, such as are sometimes caused by the blazing up of the flame, and by over-pressure in the chimney. It is adapted for high-power lamps and inverted burners. At an exhibition held in Vienna, Herr Kellermann was awarded a gold medal and a diploma of honour for his lighter.

Sig. G. Rocco's Lighthouse Apparatus.

(Stand No. 131A.)

At the western end of the Queen's Palace, we have novelty in the exhibit of Sig. G. Rocco, of Trieste. It consists of two models of his automatic apparatus for illuminating lighthouses—both for flash-light and for interval lighting. This invention is exhibited for the first time in England; but the Austrian and Italian authorities—governmental and technical—we learn have passed upon the arrangement a most favourable opinion. By the invention, many of the difficulties accompanying the existing systems of



Rocco's Installation of Rotating Lights.

illuminating lighthouses are surmounted. Two striking features of the exhibit are: (*a*) The rotatory movement is automatically caused by the pressure of the gas in going from the meter to the burner; and (*b*) the most perfect regularity of the interval between darkness and light, and the possibility of having several flashes in a second, while the greatest speed yet reached by the existing system is a flash every 15 seconds. The illustration describes the design of the invention exhibited at Earl's Court when complete, and in working order.

Buhlmann Incandescent Syndicate, Limited.

(Stand No. 133.)

In view of the full description published in the "Journal" for the 8th inst., of the process through which the Buhlmann mantle passes in its making, we can confine to narrow compass our notice of the stand where the Syndicate are exhibiting their products and demonstrating their virtues. The stand has been specially designed, with a stained glass facia in various colours. Round the inside are photographs of the Buhlmann factory, and the inquiry, "Why buy foreign mantles when you can buy better goods of British manufacture?" The attention of the visitor is called to the claim that, under the Buhlmann process, greater strength than is ordinarily the case is obtained in the ash of the mantle. A testing apparatus for demonstrating this is exhibited; and by turning a handle severe vertical and horizontal shocks are given. The visitor will be interested in ascertaining how many shocks a mantle can stand before it succumbs.

The Harris Patent Gas-Griller.

(Stand No. 150.)

In the "Journal" for Oct. 18, a full description appeared of this new gas-griller, the invention of Mr. A. E. Harris. At the same time, we gave some account of the remarkable performances of the griller; and in view of what was then stated, the exhibit which Mr. Harris is making will not fail to attract considerable attention. The accuracy of the description and of the claims already published can be verified at the stand by all interested.

The Temperley Transporter Company.

(Stand No. 153.)

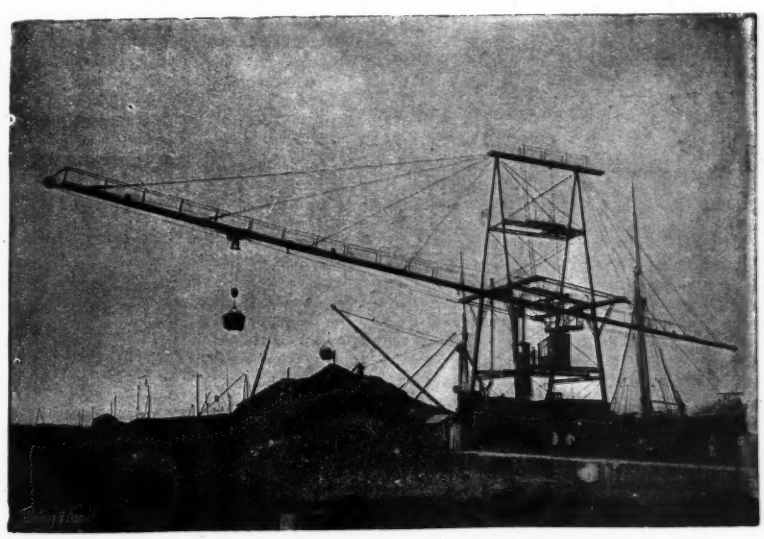
The chief feature of this Company's exhibit is a working model of a Temperley patent travelling tower transporter. The plant is shown handling the coke as it comes from the retort-house of a gas-works—forming a large stock heap in the open; filling over-

AUTOMATIC DUMPING FALL-BLOCK AND SKIP.

(The skip in the act of righting itself, after having been automatically upset. The skip may be upset at any height from the ground.)

head bunkers, from which the coke is tipped into horse carts for local delivery; and delivering the coke into railway waggons for dispatch by rail. The chief *desiderata* in a coke-handling plant are: It must not break the coke, and thereby considerably depreciate its value; it must dispense as far as possible with hand labour; it must be capable of covering a large storage ground; it must be economical in cost of working and in repairs. It is claimed that the Temperley transporter complies with all these requirements, and for these reasons: (1) Breakage is avoided by the use of a patent automatic skip and fall block. The skip can be lowered down close to the stock heap, and its contents automatically dumped on the heap—the coke only falling about a foot. (2) One man only is required to work it. He controls all the operations of lifting, transporting, lowering, and dumping the coke wherever required. (3) The standard transporter is fitted with travelling gearing; and it may be constructed with any desired over-reach on both sides, up to 100 feet. A rectangular stock heap of any length or depth, and about 200 feet wide, can, therefore, be formed if necessary. The transporter can be supplied with longer over-reaches when needed. (4) The cost of working the transporter is exceptionally small, because no machinery is ever running idle and so absorbing power without doing any useful work. It is also pointed out to the visitor that the cost of repairs is reduced to the minimum, as, owing to the small number of working parts, the wear is practically confined to the traveller wheels and the steel-wire lifting-rope. Of course, an important point not to be overlooked when considering machinery for handling material is its capability for taking material out of store for disposal. It will be noted that, in the installation exhibited, the transporter can take up the coke again from any part of the stock heap, and load it into carts or railway waggons.

A fixed inclined transporter is also exhibited. This plant is shown unloading and transporting coal by rail or water, and can be used for delivering coal either direct into the storage hoppers over the retort-house or to a coal-store. There is also on view a Temperley patent traveller of a capacity to lift and carry gross loads of 35 cwt.; so that visitors can see its actual size. It will be appreciated by the engineer that the transporters are useful for all positions where material has to be lifted and transported, with, it may be added, safety, rapidity, and economy. At the stand is an interesting selection of photographs of actual installations, showing some of the varied applications of the transporter.



TEMPERLEY TRAVELLING TOWER TRANSPORTER.

Maughan's Patent Geyser Company, Limited.

(Stand No. 152A.)

Geysers are a strong feature at the exhibition; and here we have a large series of the Maughan type—some shown in operation. Among them will be seen geysers variously designated—*e.g.*, the "New Teba," the "New Maughan," the "Holywell," the "Maughan-Teba" auto-geyser, and the "Teba" auto-geyser. The "New Teba" is spoken of by the makers "as the most perfect geyser made." It is fitted with a new patent safety-valve for shutting off the gas if the water fails. In its various sizes, it is made to heat 2, 3, and 4 gallons respectively per minute. The "New Maughan" is the original geyser of the firm brought up to date; and it has a patronage extending in number to 15,000 to its credit. The "Holywell" is a high-class geyser supplied at a low price; and by it sufficient hot water for a bath is stated to be obtainable at an expenditure of ¾d. for gas. The auto-type of geysers, as is seen by this and other exhibits, has of late years been receiving considerable attention at the hands of makers; and they certainly overcome the complaint of inconvenience when the hot-water circulation system from the kitchen boiler is out of use through the adoption of gas-cookers. The auto-geysers, too, have the advantage over the coal-fire that fuel is only consumed when hot water is being drawn. In the "Teba" type, the water is heated in tinned copper chambers, which are always full; the temperature being maintained by the bye-pass. Both the geysers and the auto-geysers are excellently finished, and every consideration has been paid to all parts in their design.

Ironmonger's Rope and Twine Company.

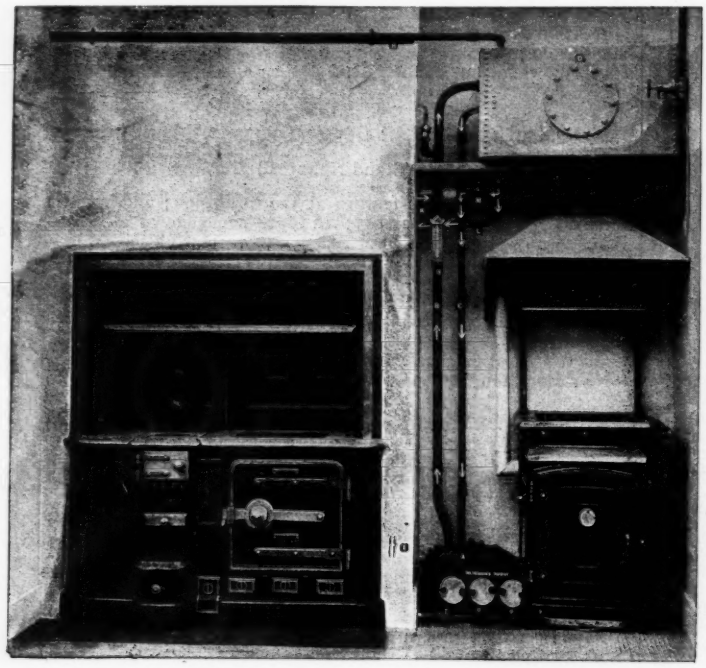
(Stand No. 155.)

Among other goods shown here are large asbestos millboard rings, built up to over 4 feet diameter, for use in making the joints of hot gas-mains, and smaller sizes for ascension pipes, and other purposes. There is also an assortment of pipe jointing of various qualities, and cotton driving-ropes, for elevators, &c. The Company's other exhibits include engine packings and general cordage.

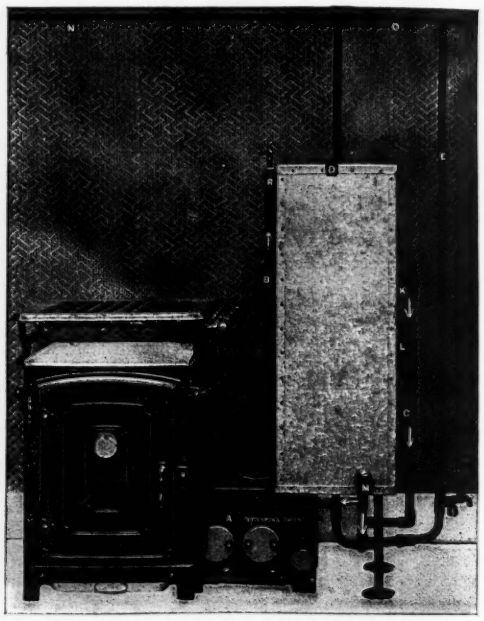
Mr. Thomas Potterton.

(Stand No. 148.)

At this stand, much that is novel will be found; the new gas-boilers for domestic hot-water supply being the special feature. The boilers are to be seen fitted to gas-cooking stoves, with different forms of circulating apparatus, and can (with the inventor's permission) be used with any sort of gas-cooking oven. The boilers are made of wrought iron with copper tubes, but can be supplied in all copper. Those made of copper are tinned inside with English block tin; and, it is pointed out, all interior parts are accessible for the periodical removal of incrustation. The boilers are made either right or left handed, with one, two, or three jets, according to size, and are so constructed that the heat which is not taken up by the water is utilized in the gas cooking-ovens. The latter have separate jets to heat them when the boilers are not in use, and also for the purpose of supplementing the heat from the boilers when required. With Mr. Potterton's special form of complete circulating apparatus (portable or otherwise), a very complete outfit is made, both for cooking and domestic hot-water supply, while the apparatus can be regulated to produce either a large or small quantity of hot water, according to requirements. It is also very suitable for use in conjunction with the kitchen range (as shown below), in which case the gas-boiler can be used in the summer, instead of the range; or, in other instances, where gas cooking is preferred (such as in flats or maisonettes) such an arrangement may be found a constant friend. A gas boiler and oven are shown, arranged to work in



Gas-Cooker and Potterton's Patent Gas-Boiler.



Potterton's Hot-Water Circulating Apparatus.

conjunction with a "Rex" range and boiler. It is pointed out that the construction of the circulating-pipes and connections to the hot-water tank enables the users to reduce the capacity of the hot-water reservoir, so that the gas-boiler has only to heat a small quantity of water in the summer, or at such other times as may be required. Besides the combined apparatus, two other forms of domestic hot-water apparatus are on view; one having two hot-water tanks covered, and the other with two cylinders (uncovered), instead of the hot-water tanks. It is intended to show working both these combinations in order to demonstrate the saving that can be effected by covering the hot-water reservoirs. The construction of the circulation systems, too, demonstrates the patent system of reducing the quantity of water to be heated. In addition to the gas apparatus, Mr. Potterton exhibits samples of the patent "Rex" and "Regina" kitcheners.

Messrs. Mobberley and Perry.

(Stand No. 158.)

While light has its charms, and moving machinery its peculiar attraction, the inanimate objects must not be overlooked. Fire-clay goods are of the highest importance to the gas manufacturer; and going to the stand of Messrs. Mobberley and Perry, a complete exhibit from fire-clay to retorts will be seen. They are indeed showing a very comprehensive assortment of their manufactures. There are gas-retorts of various sections and sizes, including horizontals and inclines. The firm have special facilities for the manufacture of the latter; and they show some of both taper and parallel sections, of good quality and finish. Included in their exhibit is a large and varied assortment of ordinary fire-bricks for retort-settings, comprising squares, splits, bevels, splays, and arches, together with an excellent selection of bricks, blocks, and tiles for generator and regenerator furnaces, bricks specially prepared and pressed for the erection of main arches, flue covers, plain and rebated sight-boxes and plugs, and shield-tiles of various sections. Among the collection are also noticed boiler-bricks, boiler flue-covers, and studded bricks for the covering of boilers. The sectional retorts shown are arranged with bottom tiles interchangeable. It may be mentioned that the firm are the proprietors of large areas of Old Stourbridge fire-clay, and are herefore in the position of being able to stock many thousand tons for "weathering," which process is of the greatest importance in ensuring "clays" being in perfect condition for manufacture. They are also the proprietors of one of the oldest Staffordshire blue brick marls, and can thus supply of their own manufacture a good quality of blue paving-bricks, for retort-house floors, coal and coke yards, and stables, splays, plinths, channels, platform, and gasholder copings, &c. The firm also exhibit a case showing fire-clay as drawn out of the mine, fire-clay "weathered," fire-clay ground ready for manufacture, pugged or tempered clay for manufacture, lumps of fire-clay (green), lumps of fire-clay (part green and burnt), lumps of fire-clay (burnt), and fire-clay (calcined) ground of various textures. A feature that will interest engineers are samples of fire-clay and fire-bricks, part green and part burnt, thus demonstrating the slight shrinkage that occurs in the firm's material in process of manufacture. There are also shown framed illustrated sheets of the firm's manufacture, which are exceptionally interesting; and, in addition, there is an excellent series of photographs, comprising a general view of the offices and Staffordshire red and blue brick works, a view of 6000 to 8000 tons of Old Stourbridge weathered clay, a kiln, and goods in transit for despatch, stoves and kilns at the Hurst works, inclined and horizontal retorts finished in stoves ready for the kiln, a view of stocks of retorts and bricks, and several others.

Smethurst Furnace and Ore Treatment Syndicate, Limited.

(Stand No. 162.)

At this stand (which was not ready on the opening day) there will be shown a system of mixing combustible gas and air. The exhibits will comprise a water burner in action (showing a flame continuously burning under water for evaporation, &c.); large burners, constructed on the same principle, applied to melting, forging, hardening, and annealing furnaces, and to under-fired pots; and specimens of materials treated.

Messrs. Wilson Carter and Pearson, Limited.

The name of Messrs. Wilson Carter and Pearson, Limited, was included among the list of exhibitors; but they are only represented by advertisement, and not a stand.

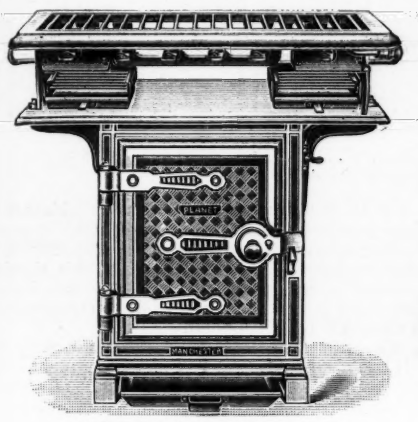
Planet Foundry Company, Limited.

(Stand No. 161.)

In a stand resplendent with its yellow and gold mountings and brackets, fluted columns, and gilded fluting, the Planet Foundry Company are showing a large assortment of their gas fires and cookers. The samples of the varieties are too numerous for individual reference; but the principal ones must be brought into notice, as they are credited with some good points.

First to be observed is a triple hotel or hospital range, with enamelled steel linings, and packed with non-conductor, loose burners, extended continuous hot-plate, and fitted with a canopy for conveying away the steam and waste products. There is also a double-oven hotel or restaurant cooker fitted similar to the other in these ranges, so that the ovens may be added to and the hot plate extended to any required length.

The "London" series of non-conducting and enamelled lined gas cooking ranges, in four sizes, as here shown, are especially adapted for letting on hire. They are all made on the most approved modern principles, with outer casings of cast iron, while the inner casings or linings are of the best steel plates, coated with a porcelain enamel of a permanent grey colour. All parts are interchangeable, and may be removed without taking the stove entirely to pieces. The sides and back of the oven are fitted each with its own separate enamelled lining complete. The non-conducting material being securely encased between, and isolated from, grease and dirt, the necessity of frequent renewal is obviated, while at the same time the cooker can be readily taken to pieces for cleaning purposes if necessary.



"Planet" Gas-Cooker.

The No. 116 "Planet" gas-cooker is on show, with extended hot plate, suitable for *cafés* and railway refreshment rooms. This cooker is fitted with two effective grillers and four boiling burners, so that fish, chops, or toast can be done independently, and several small saucepans and a kettle kept going. It is especially adapted for hospital wards, as supplied to the Royal Free Hospital, Gray's Inn Road.

On the stand is also displayed a large assortment of grilling stoves, among which attention may be called to the "Glasgow" griller and the "Manchester" griller—especially suitable for slot-meter use where this class of stove is added to installations. Boiling burners, ironing-stoves, and other domestic appliances, are well to the fore; as also the "Planet" new series of slot-meter cookers in various sizes, and which have been especially designed to meet the requirements of gas authorities who supply this class of cooker to consumers, and also to meet the necessities of those gas users who favour the slot-meter system.

In the centre of the stand is fitted the new "Barless" interior gas-fire set off by a handsome mantelpiece and overmantel in cast iron, beautifully enamelled to represent carved wood, complete with tiled hearth and curb.

The new "Uranus" Planet gas-fires in black enamel, or bronze finish, are also exhibited by this firm. The "Uranus" is a gas-fire fitted with an "improved removable high power, perfect combustion, draught proof, safety" burner, and nickel-plated trivet. By the special arrangement of the burner, a carefully adjusted supply of air is induced, "causing the fuel to become more incandescent and increasing the radiant heat." The upper part over the canopy is fitted with radiating gills, giving a continual circulation of warmed air, and greatly increasing the heating power of the stove. The design is certainly unique and up to date.

A large assortment of the "Mars," "Venus," "Mercury," and "Nursery" gas-fires is shown in fine black enamel finish, tiled, art bronzed, and with beautiful porcelain enamel. This latter is now much in vogue, being easy to clean—simply requiring to be dusted lightly.

Planet "Uranus" Gas-Fire.

For the "Planet" condensing stove is claimed special heating power, by a peculiar arrangement of the base, which is converted into a condensing chamber where the hot gases are finally dealt with instead of in the descending tubes, which consequently give off more heat. The receiver at the bottom is so arranged as to prevent any dripping of condensation on the floor. In this connection, it may be mentioned that among the specialities of the firm, is the "Capstan" regenerative gas heating-stove. This is fitted in the cap with patent gills, through which there is a constant circulation of air. The copper reflector is spun in one piece and highly polished. This, with a series of diamond-shaped rubies inserted in the cap frieze, gives a very brilliant effect when burning.

The Planet regenerative gas-heating stoves are also of the same class. Here the gills are fixed across the top of the stove; and the products of combustion from the flames pass up the flues and heat the gills red hot. The air entering at the back of the gills to feed the flames is heated as it ascends the passages. Better results are said to be obtained by this system of regeneration as regards the heat obtained from the gas and utilized for heating a room, and also as regards the character of the flue gases after they leave the stove. It is claimed that this form of heating stove can be used in an ordinarily ventilated place without a flue—as a matter of fact the stoves are extensively used in the Northern Counties in shops, banks, waiting-rooms, vestries, schools, &c.

Planet "Capstan" Regenerative Gas Heating Stove.

Messrs. Joseph Taylor and Co.

(Stand No. 170.)

Some heavy exhibits are found at this stand; and they are illustrative of the excellence of Messrs. Joseph Taylor and Co.'s work. Prominent among the exhibits (which, by the way, were all erected at Bolton complete previous to being forwarded to Earl's Court), are two of the firm's types of solid-plate lead saturators—a No. 1, or one of the "Premier" build, and a No. 4. There is also a 6 feet internal diameter section, showing one of the leading solid-plate lead circular saturators, designed for either steam-emptying, steam-discharging, or for hand-fishing. These are made from thicknesses varying from $\frac{1}{2}$ inch to $1\frac{1}{2}$ inches, and are from one plate only, with a single vertical seam. The seam, as will be seen, is made double proof by a strongly built lead V piece, which has a solid steel tube in the centre. The V pieces are six in number, and are equally distributed all round on the outside of the saturator. The saturator is cased by Rangoon teak or other suitable timber, and well banded. The visitor is informed that the burning is not by the oxy-hydrogen blowpipe, but by a special process, which is of a thoroughly trustworthy nature. On a stand are shown photographs of every description of saturators, coils, tanks, &c., as supplied during the last eight years; samples of solid-drawn lead pipes as employed in these saturators in connection with ammonia and acid and steam-pipe arrangements; and various samples of lead burning, flat and upright, from different thicknesses of lead. There are also a sulphate draining-table, acid cocks, lead acid buckets, copper scoops, sulphate steam-raisers or dischargers, Taylor's improved make of acid and ammonia catch-box (with outlet return and syphon to the saturator), also models, &c. The chief points of novelty consist of one of the No. 1 "Premier" build of hand-fishing saturators, fitted with double detachable ammonia pipes, detachable acid and steam pipe arrangement, fixed on a solid lead base with four lead-lined channels, including an outlet to the mother liquor tank, and fitted with improved sulphate draining-table, the burning of which is done on both sides. It will be noticed that all the saturator foundations and around the draining-table are covered with light lead, made perfectly acid tight. This not only saves all splashings, boiling over, and the like, but collects and conveys same to the mother liquor tank.

The Tourtel Manufacturing Company, Limited.

(Stand No. 156.)

A large number of samples of meter parts are found here—particularly the Company's patent diaphragms, and their patent seal padlocks for prepayment meters. Regarding the former, fig. 1 is the front view of a dry gas-meter, with the front cover removed, showing the diaphragm; and fig. 2 is a side section of the meter, showing one diaphragm fixed and the other removed—the position of the latter being shown in dotted lines. The diaphragm chamber is a dish-like receptacle *a* stamped out of

Fig 1.

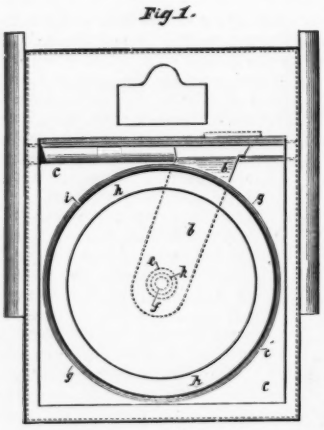
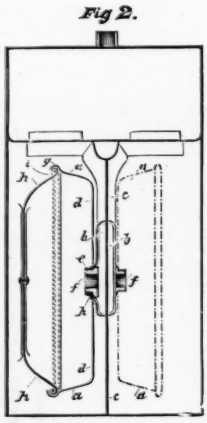
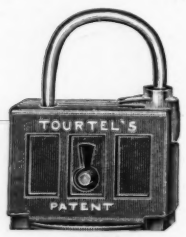
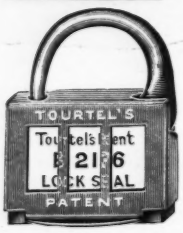
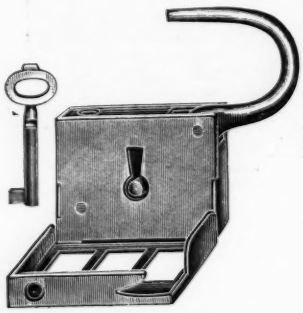


Fig 2.









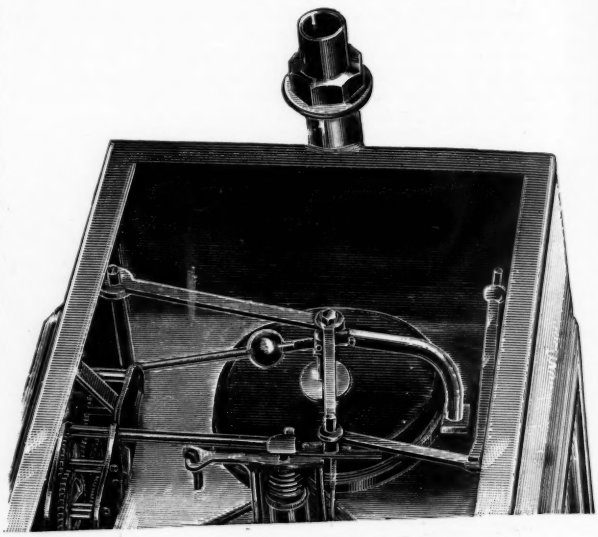
sheet metal in one piece; and on its open side at *g* the diaphragm *h* is fixed by a wire *i*. At the back of the dish is an opening provided with an internally-threaded coupling *e*, which is screwed on to an externally-threaded nozzle *f* fixed to the gas-passage *b*. The joint between *e* and *f* is made by a leather washer. It will thus be seen that the dish can be instantly screwed on or removed. Many advantages are claimed for this diaphragm. As to the seal padlock, it is interesting to learn that above 150,000 are in use in the country for sealing prepayment gas-meters and boxes. The padlock, which is self-locking, is provided with a hinged front, between which and the keyhole, the seal (a paper or other shield) is placed, and is thereby secured; so that, after the padlock is closed, it cannot be opened by anyone without destroying the seal, and so leaving evidence of tampering.

Messrs. James Milne and Son, Limited.

(Stand No. 159.)

Messrs. James Milne and Son, Limited (who were among the earliest to connect themselves with the gas industry), have continued to manufacture apparatus for use in making, distributing, and burning gas in all the various departments, and they show many recent inventions of much merit. The larger portion of their stand is taken up by apparatus for use in the different parts of a gas-works or in the distribution system. A special feature of their exhibit is the front of a square station meter of ornamental design, fitted with index, clock, and tell-tale on a *repoussé* copper dial plate, and inlet and outlet pressure and constant level overflow gauges. They display a number of meters of every variety, both wet and dry, including inspector's, consumers', and prepayment meters. Their composite meter is a compromise between a tinplate and a cast-iron dry meter, and consists of a cast-iron case underneath the index and brass side tubes. The interior, including the valve plate and division plate, is made of heavy tinplate, so that the meter can be easily opened and repaired; and it is claimed that this arrangement is an improvement on the cast-iron valve plate. A test-holder is shown with cast-iron tank, as also various appliances for proving and testing the different meters.

Macfie's governor meter is a novelty which is sure to command special attention, as it meets the demand for a simple and economical means of controlling pressure at the point of supply; for in this apparatus the governor forms an integral part of the meter.



Macfie's Governor Meter.

The arrangement enables the gas manufacturers to regulate the pressure according to local conditions, and ensures, in the interest of the buyer and seller alike, that gas is being consumed under the most favourable conditions. For hilly districts, this should be a very useful piece of apparatus. The whole governor is enclosed; access being had to it through a keyhole to regulate the pressure at which the gas is to be supplied.

A stop meter is also shown, having similar features to the prepayment meter. It has a range of 1400 feet for prepayment, and is set by a milled button, which is accessible only after the removal of a padlock. A number of test-meters are also on view of both the wet and dry types, many of them arranged for special purposes, such as a simple and cheap burner meter of a popular kind for the use of ironmongers and gas-fitters for testing the consumption of incandescent and other burners. There are also a number of photometrical test-meters, some with special arrangements for automatically correcting for temperature and barometrical pressure, and the same meters with an automatic stop-action clock when the meter has made a predetermined number of revolutions.

A complete photometer of the Referees table type contains sundry additions in the way of the clock-stop meter already referred to, with the temperature and barometrical pressure correcting apparatus and quadrant cock, fitted with a porcelain slate, so that the average of the four tests may be judged by the eye. This renders the testing an almost mechanical and automatic operation, as there are no calculations to be made; and the result corrected in every way is shown on the dial of the clock in candle-power. An "Extra-Rapid" photometer is also exhibited worked on somewhat similar lines, but of smaller size and of simple nature for quick tests, specially serviceable where enrichment is practised, and the gas is required to be tested before and after the process. Jet photometers of several kinds are included for both illuminating and power gases, and a durability-test apparatus, wherein the time taken to consume one-tenth cubic foot with a flame of fixed height gives a measure of the photometrical value of the gas. A leakage indicator is shown for testing the gas-pipes in a building by causing the gas required to keep up the pressure to bubble through a slight seal of water. Many of these, it is understood, have been supplied, and have proved useful, to gas companies who undertake the examination of such fittings in the interest of the consumer. King's gauges in tin and cast-iron cases of several sizes are on view, with and without electric bell attachment to ring in the manager's office; and O'Connor's pressure indicator, which, unlike the King's gauge, is always set at zero. Station, safety, and district governors for high and low pressures are exhibited, some of the latter of which have been made for an inlet pressure of 3 lbs. per square inch, or 84 inches of water, for distribution from high-pressure mains to the low-pressure districts; and pressure-reducers, by which the gas pressure is reduced by a constant amount according to the weights upon them.

A stack of rack-and-pinion and other valves shows another branch of the firm's manufactures. For examination, too, are pressure and exhaust gauges on Milne's patent "Handy" prin-

ciple, by which the glasses can be rapidly removed for cleaning and other purposes, registers of pressure and vacuum of several different kinds, both portable and otherwise, sight-feeds for benzol and ammoniacal liquor, a number of tests for impurities, including a new patent test for carbonic acid in generator furnaces, so that the quantity of primary and secondary air can be adjusted. As is explained in the leaflet describing the apparatus, if more than 5 per cent. of carbonic acid is present in the furnace, then too much primary air is being inserted; and if less than 16·6 per cent. is found in the waste-gas flues, then insufficient secondary air is being inserted. Thus this apparatus—which can be connected to a wrought-iron pipe in the furnace, and which shows the quantity of carbonic acid by the number of pumpings of a spring-released pump of known capacity—is so simple that any workman can use it, and ascertain for himself the satisfactory working of the furnaces under his charge.

THE CARBONIC ACID PUMP TEST.

A lantern with new flash-light apparatus for incandescent burners is another exhibit to claim attention. It consists of a bent arm which may be made to project through a hole in the side of the lantern, and is there lighted, and then made to travel over the top of the mantle, and ignite the gas. It is then further turned against the side of the lamp, and is extinguished, so that the flash-light is only burning during the moment of lighting.

An interesting exhibit is a meter manufactured by the firm in 1827 alongside of several models of more recent inventions of high-speed meters. A large part of the stand is taken up with the display of novel and artistic gas-fittings for flat-flame and incandescent burners, both ordinary and inverted, all of which are of the firm's own design and manufacture.

Hanwell Gas Pendant Company.

(Stand No. 154.)

Coming to this stand, it will be seen that the rising and falling pendants of the Hanwell Company, in which flexible tubing plays an important part, have had several additions made to them since we noticed their attractive features at the time of the Ironmongers' Exhibition. Not only can the fitting now be used for inverted burners, but it has been successfully adapted to the ordinary "C" and Kern burners. Apart from serviceableness, such fittings as these, when intended for use in rooms where decoration plays an important part, must be fitted with fancy shades; otherwise they would look plain and incongruous among the other appointments. One of the aids to improvement in this respect is seen to be a silk and cardboard shade holder. This is a simple steel-spring arrangement, fitting into a slotted brass hook; the shade being held firmly in position so that the pendant can even be raised and lowered by the shade alone, making it impossible for anyone to accidentally disarrange the shade.

HANWELL'S ADJUSTABLE PENDANT.

Another good accessory, as mentioned, is a method by which the ordinary "C" or Kern burner is used with the Hanwell pendant. An eliptical harp is fitted with a patent detachable clip, with brass stamping, that carries an ordinary duplex silk lamp-shade, and not only converts this into a dressy and artistic gas-fitting, but the stamping is automatically adjustable so that the shade holder can be raised and lowered to suit a high Kern burner, or (to go to the other extreme) a "Gem" burner may be satisfactorily used with the same shade. Ironmongers will appreciate this, as it means that they have only to buy a supply of the Hanwell pendants for upright burners and utilize their present stock of oil-lamp shades. At the same time they can make a charming window display, and give the public an idea of what can be done with really artistic gas-lighting.

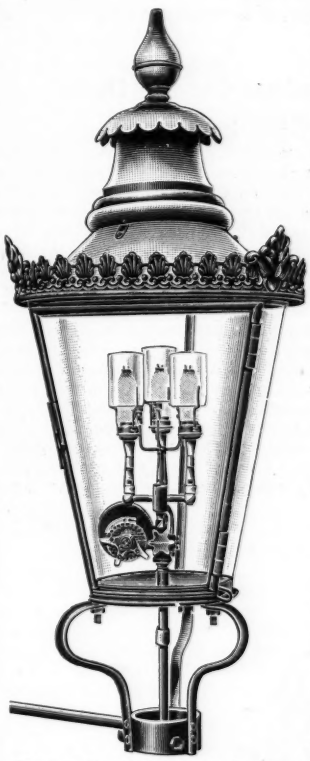
The tap to the Hanwell pendant for inverted burners has now been greatly improved. The lever has been fitted with a vulcanite sleeve, effectively preventing the sting of the heat to the fingers when turning off.

Other novelties are the fittings for groups of three inverted burners; while the 3-light acetylene pendant has, it is asserted, proved an absolutely reliable fitting when used with this very penetrating gas.

The Automatic Light Controlling Company, Limited.

(Stand No. 157.)

The speciality of the above Company—Gunning's system of automatic lighting for street-lamps—is exhibited at this stand. The apparatus is shown in operation with a variety of burners—flat-flame, incandescent, and self-intensified. Excellent progress, we learn, has been made by the Company since last the system was noticed in the "JOURNAL;" and it is gratifying to hear that such a pronounced practical success has been achieved by this British invention. Gas engineers have long had before them the problem of automatic lighting; and there is no doubt that many engineers in this country have solved it by their adoption of the Gunning system. A number of gas companies and lighting authorities have made installations on a large scale; and at the present time there are upwards of 40 towns in Great Britain where the Gunning apparatus has been utilized either for all lamps or for large districts, and 200 towns are utilizing it for smaller districts. The length of time that many of these installations have been working in this country has enabled engineers to accurately determine the value of the apparatus for considerable periods when used for whole towns or districts. Though it savours somewhat of advertisement, we may, in view of the novelty and experience, quote one testimony of the value of the system in the essential points of reliability, ease of working, and savings effected. The letter is from the Huyton and Roby Gas Company:



GUNNING'S SYSTEM OF AUTOMATIC GAS LIGHTING.

> Our district is lighted by 210 lamps, all fitted with incandescent burners and your controllers. Previous to adopting the controllers we employed three lamplighters, and also a young man to clean the lamps and renew mantles, &c. The total wages of these four employees averaged about £120 per annum. We now employ one man at 21s. per week to wind up the clocks, renew mantles, and clean lamps. His time is fully occupied. There is a considerable saving in the mantles from the fewer breakages; and now they have mostly to be renewed for depreciation of light only. With regard to gas, the controllers permit of a more regular and definite time for lighting and extinguishing. After fifteen months' working, I still find them satisfactory. The renewals are not numerous; and the facilities and attention given by you for replacement prevents any inconvenience. The torch will soon be as antiquated as the ladder for lighting; it is only a matter of time when the controllers will replace these methods entirely.

Such results as these must appeal forcibly to all gas managers; and when it is added that, in larger installations—such as that at Folkestone, where all the lamps (1050) are fitted with the system—the savings are proportionately greater, it is clear the apparatus must take a prominent position in the progress of modern street lighting. It is noted in viewing the exhibits, that the Company are not satisfied to rest content without improving their system. The apparatus is now supplied with a simple time-setting arrangement, by which the light is turned on and off at the actual time required. This applies both to single burners and also to clusters, with midnight arrangement. A further improvement is of great utility in factory districts, as, by it, the lamps may be entirely extinguished at about midnight, and relighted for an hour-and-a-half in the early morning, when workpeople are about.

Messrs. Clark W. Harrison and Co.

(Stand No. 163.)

This stand contains something special and unique in the way of inside and outdoor lamps—entitled "Khoma" lamps. On the outside lamps are superheating chambers, which heat and expand the gas before ejecting it into the bunsen tube, thereby making a better gaseous mixture—and consequently better combustion—the gas "being in a much superior form for mixing with the air

than when it is in a cold state." The outside lamp has a waterproof shield over the door, which is also a very important feature, and is said to "solve the problem of outside lighting by incandescent gas."

Messrs. Edward Le Bas and Co.

(Stand No. 164.)

With regard to this exhibit, Messrs. Edward Le Bas and Co. are showing a line of pipe from ⅛ inch up to 8 inches, also wrought fittings of every description in gas, steam, and water quality. They are making a special exhibit of the noted "G.F." malleable fittings (also in gas, steam, and water quality), of which there are over 3000 varieties. The new "Perfecta" double-acting piston-pump is seen. The firm are also exhibiting an iron sheet, covered with their "Carbonizing" coating, which, it is reckoned, is the only permanent protection for iron and steel work against rust. Some of the largest gasholders in America are now being coated with this special paint. A galvanized sheet is painted with their patent "Galvanum," which, it is stated, will adhere for years to galvanized iron. The stand is surrounded with special "G.F." railing work and fittings, all of which are worth the attention of engineers.

James Keith and Blackman Company, Limited.

(Stand No. 160.)

The Keith light specialities are too well known to need detailed reference here; but the Company's contribution to the exhibition is an excellent one, and must receive a word of praise. For the exhibit of gas-fittings, they have a wrought-iron framework passing round three sides of their stand (the fourth side backing on to the wall). The uprights are formed as lamp-columns—the tops being surmounted by lamps of various candle power; while the horizontal rails running from column to column support numerous suspension lamps. The whole is relieved by scroll ironwork and an illuminated sign. Gas-compressors naturally form a very important section of the exhibit. There is a No. 6 compressor capable of dealing with 6000 cubic feet of gas per hour, and driven by water-motors. In action, is one of the No. 4 water-driven compressors, and a No. 4 power-driven compressor, worked by a small gas-engine. These two machines form a duplicated plant for supplying the gas to the lights on the stand and for lighting one-half of the Queen's Palace. Four of the No. 3 machines are shown, each capable of dealing with 500 cubic feet of gas per hour.

An Electrically Driven Keith Gas Compressor.

One is fitted with a water-motor with open holder tank; one fitted with a water-motor and enclosed holder tank; one is for power driving by belting; and the last is electrically driven, complete with motor, direct acting. Further specimens of the smaller size machines, Nos. 0, 1, and 2, capable of dealing with 70, 150, and 250 cubic feet of gas per hour respectively, are also on view. A general assortment of fittings is shown suitable for high-pressure lighting, either for indoor or outdoor use. These are fitted with different standards of lighting units from 150 to 1000 candle power, with column and suspension anti-vibrators, and various forms of control for lighting and extinguishing, including the ordinary pilot-light, flashing bye-pass electric lighter, and automatic mercurial seal for distant control. The Company's latest pattern of fitting is shown, and is intended to give a 30-candle power light, with a consumption of 1 cubic foot of gas per hour. This fitting is made on the inverted principle, and is particularly suitable for such positions and trades as require that each attendant, machine, table, &c., should have an independent light. The chief advantage claimed for it, beyond its small consumption, is the cost of maintenance. The mantle is shaped on the burner from a flat disc of fabric uncolodionized, and will be supplied at ½d. each. This principle, to the best of our knowledge, is unique, and gives to the fitting an advantage which gas engineers have been striving to obtain for some time—viz., that its upkeep is reduced in proportion to its gas consumption when compared with a larger burner. Hitherto it has only been the gas consumption which has been reduced; the cost of mantles remaining as expensive as for a larger burner. From the wall at the back of the stand are shown various forms of lanterns and fittings supported by brackets. In addition are seen a Summerscales collar ironing machine and crimping machine adapted for high-pressure gas, and also ordinary laundry hand-irons adapted in a similar manner. The object is to illustrate that with laundries only one gas-compressor is required to supply gas both for the general work in the laundry and for lighting. On two lamps over tables, numerous sundries for both high and ordinary low-pressure lighting, together with burners adapted for the latter, are exhibited. One of Keith's gas-heated circulating hot-water boilers is in operation, heating a radiator, as well as specimens of the Blackman air-propellers, both belt and electrically driven.

The Company have also undertaken to supply a general light to one-half of the Queen's Palace—that is, from the centre gangway to the extreme end. This they are doing by means of twenty 1000-candle power "Taj" lamps arranged in three rows. All these are supplied from a compressor on the stand, and are fitted with Keith's patent automatic bye-pass, by means of which the whole twenty lamps can be lighted and extinguished simultaneously, merely by the action of turning on or off a cock fixed on the delivery-pipe from the stand. A display of photographs of installations of interior and exterior lighting by the Keith system taken at night time are also interesting.

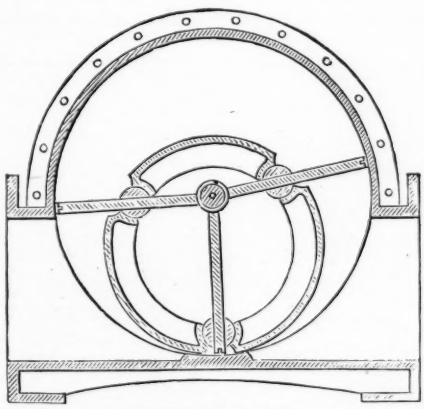
Messrs. George Waller and Son.

(Stand No. 165.)

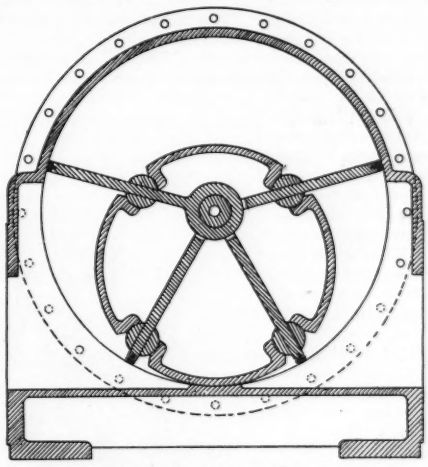
This old-established firm make a fine display of their manufactures. "Old-established" is a title which cannot be disputed; for the length of their business is almost coincident with the number of years the gas industry itself has been established. We may be pardoned for taking this opportunity of prefacing the mention of their exhibits with two or three historical facts. It is over a century now since the business was started. The works were originally located at Holland Street, Southwark, from which locality the firm moved down to Stroud about fourteen years ago, in order to expand their business. The founder was James Burton; and the style of the firm for many years was Burton and Sons, then Burton, Sons, and Waller, and more recently Waller and Son. For the last fifty years they have made a speciality of exhausting machinery, some of the early Beale type having been made by them. Of recent years they have manufactured almost exclusively their well-known patent three and four blade exhausters. These were patented by Mr. George Waller nearly twenty-five years ago; and they have made something above a thousand of them. The exhausters are made with three blades up to and including 30,000 cubic feet per hour, and above this size they are fitted with four blades. The three and four blade machines are made on precisely the same principle; the chief features being greater delivery of gas per revolution than the two-blade Beale type, a much steadier gauge maintained in running, and very much less power required to drive them. The interior parts are made entirely of cast iron to resist corrosion by tar, &c. The blades are hinged on to a central spindle supported in the back cover, and passed through slotted rolls, which are fitted into the inner drum; these latter oscillating sufficiently to allow for the opening and closing of the blades as they rotate. The drum of the exhauster is truly cylindrical; and as the blades work concentrically they require no segment pieces to draw them in and out, which accounts largely for the reduced friction. The other specialities, besides exhausting machinery, to which Messrs. Waller and Son pay particular attention, are gas-valves of all descriptions, coke breaking and elevating machinery, pumps and pumping machinery for tar, liquor, and water—in fact, for gas-works purposes generally.

The firm are exhibiting models of the three and four blade exhausters. There are also on view a horizontal engine, with exhauster combined ("A" type set), of their standard 20,000

cubic feet per hour capacity, with inlet and outlet valves; one of their patent combined exhausting sets ("F" type pattern), with small vertical gas-engine direct coupled, for 3000 cubic feet per hour, with inlet and outlet valves, automatic bye-pass valve, gas-governor, and compensating valve—all self-contained on one base-plate; also a similar set, only with vertical steam-engine direct coupled, of the "G" type. Another exhibit is a small combined engine and exhauster or blower, capable of dealing with 500 cubic feet per hour, specially designed for passing air through purifiers; and then a No. 4 size Waller improved Thomas and Somerville coke-breaking machine, for dealing with 8 to 10 tons per hour, will be observed. A set of new pattern oil-injectors for lubricating exhausters, made of cast iron to resist corrosion, are noticed. In these lubricators, the small valves and springs previously provided (which was a frequent source of trouble) are dispensed with, rendering the lubricators much more reliable



Waller's Three-Blade Exhauster.



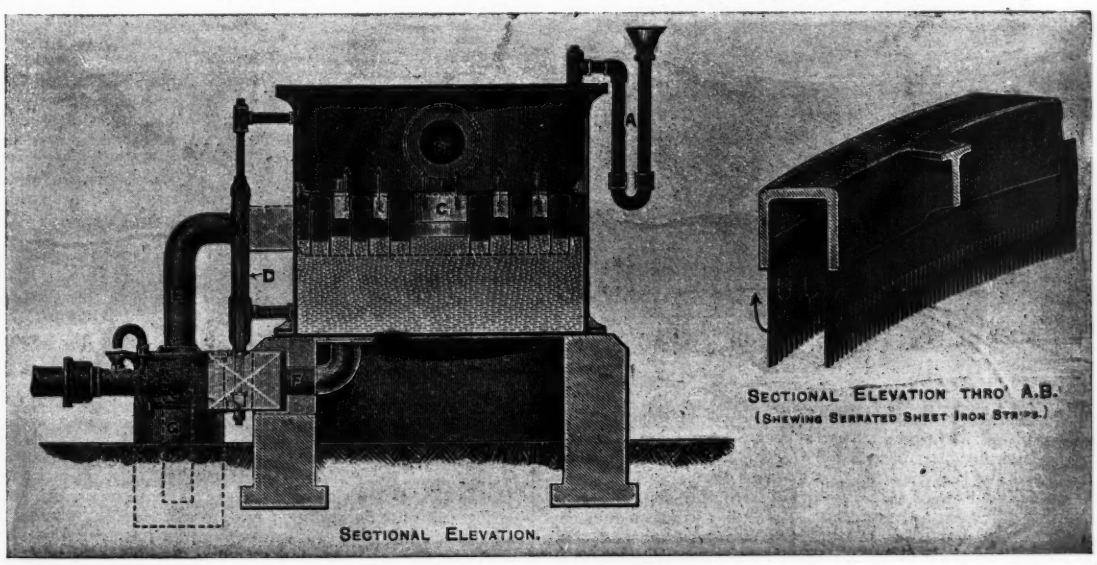
Waller's Four-Blade Exhauster.

in their action. Further exhibits are a Waller "Phœnix" type of direct-acting steam tar or liquor pump, as well as a small belt-driven column pump for tar or liquor. The stand also contains a number of photographs, illustrating examples of the firm's exhausting machinery, pumping machinery, coke-breakers, concrete mixing machinery, &c. It will be seen from this notice of the exhibits, that here is provided interest for the engineers of both large and small works, who will agree that, with the lengthening of the life of the firm, their apparatus has appreciated and not depreciated in working value.

Messrs. J. Firth Blakeley and Co.

(Stand No. 166.)

The stand bearing the above number is tenanted by Messrs. J. Firth Blakeley and Co., who are showing three special exhibits—their improved combined gas-engine and exhauster, Cripps's patent automatic washer and tar-extractor, and a three-throw steam-pump for clean water, liquor, and tar. Among the points to which the favourable consideration of the visitor is invited are: In regard to the combined gas-engine and exhauster on the one bed-plate, "the speed of the exhauster is reduced one-third from that of the gas-engine by means of spur gearing; wood mortice teeth diminishing the noise in working practically to a minimum." In this way, the lifetime of the exhauster is lengthened—this being, to use the exhibitors' own words, "a very marked advantage over other forms where the exhauster is driven direct from the gas-engine shaft." As to Cripps's automatic gas-washer for the extraction of tar, ammonia, and carbonic acid from coal gas, we give an illustration, in which A represents the clean water or liquor supply pipe, B the gas outlet, C the washer chambers, D the continuous tar outlet from the base of the washer, E the liquor overflow, with seal-regulating valve, F the tar-flushing valve and pipes, G the overflow seal well, and H the gas-inlet. The advantages claimed are "the continuous withdrawal of tar from the base without disturbing the liquor level above; the frequent flushing-out of tar, and consequent unsealing of the washer, is therefore entirely avoided; the greatest possible sub division of gas in the area occupied; and the most intimate contact with the liquor is secured with the minimum of back-pressure. All the wrought-iron serrated strips being fixed to one horizontal disc, they are absolutely true and level, thereby giving an equal seal and uniform passage for the gas throughout the entire surface of the liquor. The washer is simple in construction, is self-cleansing in its action, and is made either square or round. It is admirably adapted for fixing before the scrubbers, ensuring the removal of all tar compounds left in the gas after passing the condensers. As to the third exhibit—the special three-throw pump for tar, ammoniacal liquor, and water—it is pointed out that this type of pump is fitted with fast-and-loose pulleys, and each barrel is well packed, and fitted with brass or iron stuffing boxes and glands and wrought-iron connecting-rods. The working barrels are 2½ inches bore—No. 1 has a 2-inch diameter inlet, and is used for pumping tar; No. 2 is provided with an air vessel and 2-inch retaining valve, and is used for pumping ammoniacal liquor; No. 3 is also provided with an air-vessel and 1¼-inch diameter retaining valve for pumping water.



The Automatic Gas Washer (Cripps's Patent).

Messrs. Bryan Donkin and Clench, Limited.

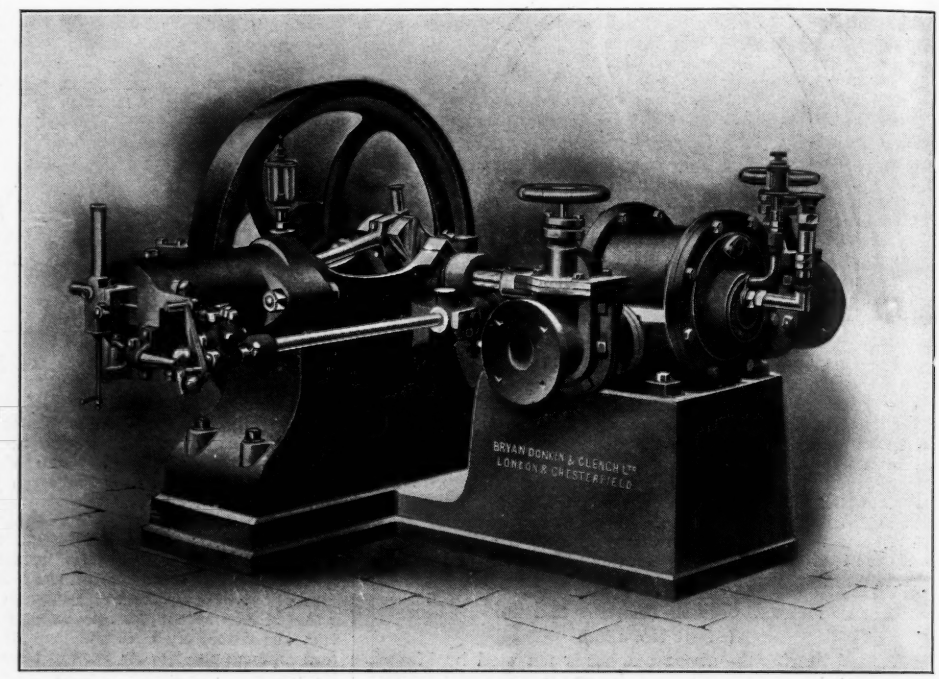
(Stand No. 169.)

This firm, like many others who have transportable plant, have succeeded in bringing together a class of exhibits that has great attraction for all gas engineers, and more particularly for those whose interests have a decided mechanical bent. They show the latest examples of their gas exhausting plants, a gas compressing plant, the well-known "Donkin" gas-valves, and several other specialities of the firm. Of the two gas exhausting plants shown, the smaller consists of an exhauster capable of passing any quantity of gas up to 2000 cubic feet per hour, driven by a gas-engine—both engine and exhauster being mounted on a cast-iron underbed. The larger exhausting plant is especially notable owing to the excellent design of the vertical steam-engine driving the exhauster—a type of engine that has recently been brought out by the firm. The exhauster will pass 30,000 cubic feet of gas per hour, at a speed of 60 revolutions per minute. The engine has a cylinder $7\frac{1}{2}$ inches in diameter by 5-inch stroke, and is fitted with a piston valve, in place of the customary flat D valve. The ample size and proportion of the bearings are especially notable. The shape of the bedplate is arranged to prevent oil-splashing. Both engine and exhauster are mounted on a deep cast-iron underbed, in accordance with the usual practice of the firm. The plant is especially designed to run for long periods without any attention to the bearings, &c.; all oiling being continuous from a central distribution box.

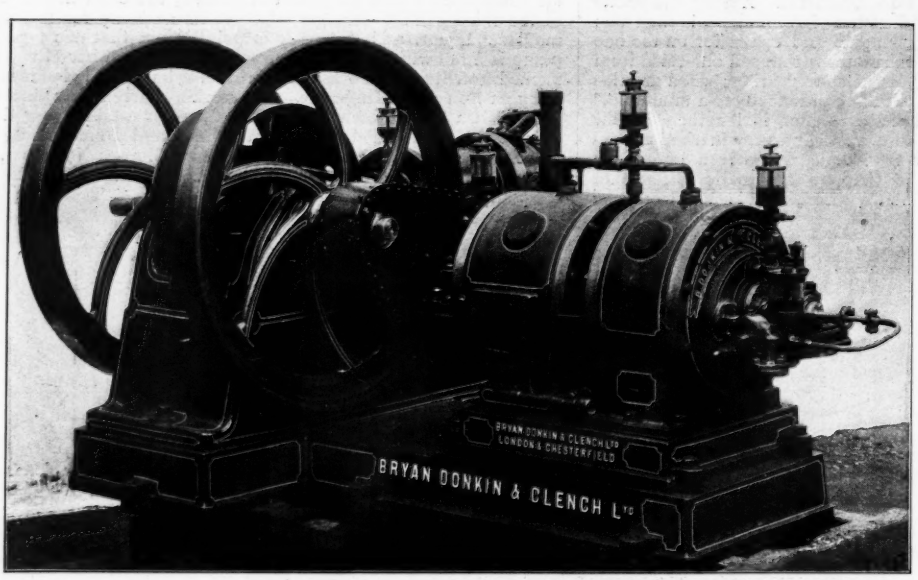
The firm are also exhibiting a decided novelty in the shape of a new special rotary compressor which they have just brought out for the purpose of pumping gas at any pressure up to 20 lbs. per square inch for distribution purposes. The papers recently read by Professor Unwin and Mr. George Helps, of Nuneaton, before the Institution of Gas Engineers, and the installation at Laclede in California, a description of which appeared recently in the "JOURNAL," give this exhibit special interest. The compressor, which is shown at work driven by a gas-engine through gearing, runs at a speed of about 110 revolutions per minute. It is on the compound principle, so that the compression up to the final outlet pressure is divided up between two water-jacketed cylinders. The interior construction of the machine (forming the subject of a patent) is specially designed for dealing with high pressures. It is claimed that the advantages of these machines over the reciprocating type of compressor are: Reduced first cost; absence of all valves; even flow of gas; simplicity of construction; and fewness of working parts.

The well-known leading types of gas-valves are exhibited, also a model of purifier connections, showing the simplification effected by using four-way valves on the connections. For example, for four purifier boxes, six four-way valves enable any box to be by-passed, and also allow the boxes to be worked in any order. This principle can be extended on the unit system to any number of boxes; and, moreover, the connections required are very simple. We notice that Messrs. Bryan Donkin and Clench are supplying all the valves required for the distribution of gas in the South-Staffordshire power gas scheme, in which Mond gas will be delivered at a pressure of 10 lbs. per square inch.

An interesting calorimeter is shown, of the bomb form, for the accurate determination of the heating value of various fuels, such as coal, coke, oils, &c. This instrument, which is based on Mahler's original bomb calorimeter, gives results, we understand, accurate to within 0·3 per cent.; and it is said that "on the Continent it is the standard instrument for accurate work."



BRYAN DONKIN AND CLENCH'S COMBINED GAS-ENGINE AND EXHAUSTER.



NEW COMPRESSION PLANT.

Messrs. E. C. Hayward and Co.

(Stand No. 167.)

A brilliant display is being made at this stand with the "Humphrey" gas arc lamp, which has been particularly described and illustrated in the "JOURNAL" on a previous occasion. The lamps shown embrace the ordinary patterns for commercial inside and outside lighting; and, in addition, there are new ornamental arc lamps specially designed for indoor lighting and residences. Among the other patterns is one for factory and works use. The "Humphrey" flash-light sign for gas is also shown; and it is mentioned as a notable point that this was "the only

novelty in gas work calling for comment at the St. Louis Exhibition this year." The arrangement will be found fitted with red, white, and blue globes; and it may prove very useful for gas managers in advertising their own goods, as well as for recommendation to tradesmen.

Messrs. Kirkham, Hulett, and Chandler, Limited.

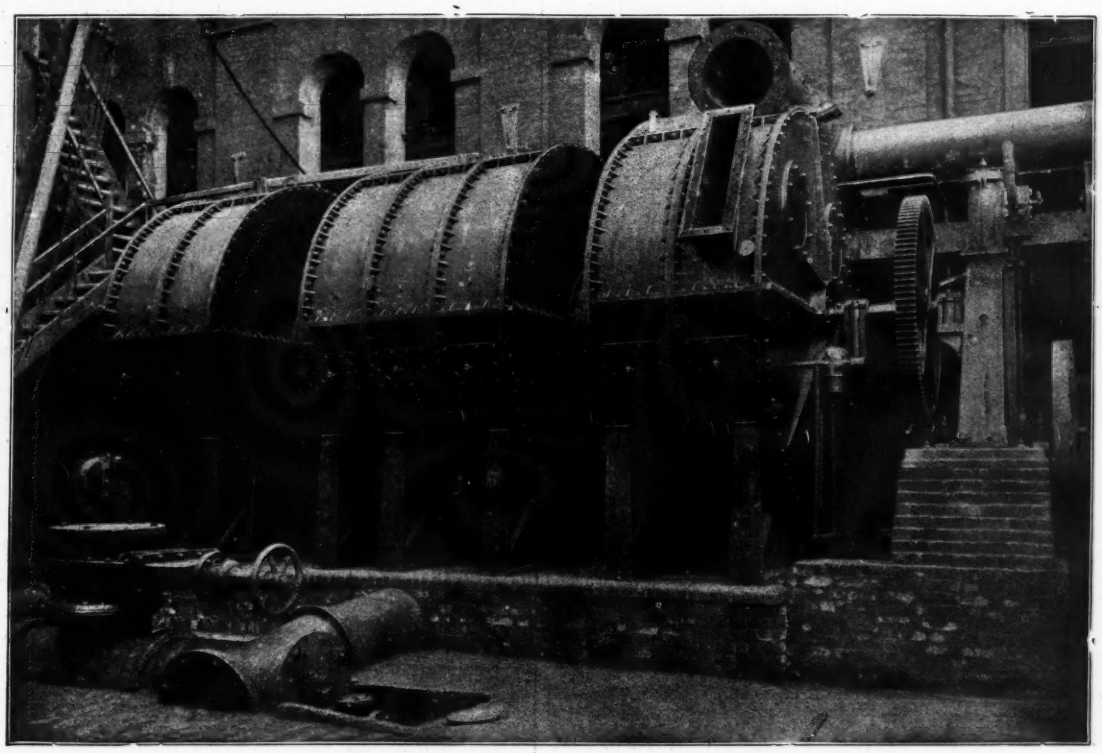
(Stand No. 168.)

Messrs. Kirkham, Hulett, and Chandler, Limited, have taken up the major part of their space with two prominent exhibits. The first is an example of their improved type of patent "Standard" washer-scrubber. This particular machine, it is noteworthy, is one that is destined for the Enfield Gas Company's works. The "Standard" washer-scrubbers are known throughout the industry; but it may not be out of place here to briefly point out some of the differences between the old and new types. In the old pattern patent "Standard" washer-scrubbers (and some other forms of washer-scrubbers), the bearings were in the washing chambers and difficult of access. Consequently, after the machines had been in operation continuously for a number of years, there was a liability of the shaft to fracture owing to wear of it and the bearings, absence of lining up of the latter, and consequent lack of support to the former. This disadvantage is said to be overcome in the improved "Standard" washer-scrubber.

By referring to the accompanying illustration, it will be seen that the machine is constructed in sections, between which are cylindrical chambers containing the bearings. These chambers are constructed in halves; and on the removal of the upper plates, the bearings and shaft can be inspected and the plummer-blocks lined up if necessary—an operation requiring only a few hours. No additional stuffing-boxes are required, as the shaft passes through the washing and bearing chambers.

The washing "bundles" are constructed with washing surfaces spaced equi-distant apart. Consequently all the surface provided is effective, as none is in contact. The "bundles," being mainly constructed of wood, are partly supported by the washing liquid; and the shaft and bearings are accordingly relieved of weight to a material extent. The boards are prevented from warping by specially arranged wooden strips, which deflect the gas, and cause it to pass circuitously through the "bundles."

The second exhibit is a model of the patent "Standard" grids in a section of a purifier. With regard to these, the following advantages are claimed: Large increase in volume of material, and consequently in capacity of purifiers; large decrease in back-pressure; material thoroughly exhausted; purifiers in use longer periods without changing material; and no alteration required to existing purifiers.



"Standard" Washer-Scrubber as Erected at Portsmouth.

(There is a little difference between the machine illustrated and the one exhibited; the Enfield machine, being smaller, has one intermediate chamber instead of two.)

The "Chameleon Sign," Limited.

Advertising signs of various kinds for use with gas or electricity are the specialities of this Company. The signs are encased in a cabinet, large or small, and of any shape suitable for facia, window, show, or counter decoration. One or more sides have an opal glass bearing an advertisement, which by day can be made to imitate a brilliant sign, with embossed gold lettering, enamelled iron tablet, &c.; and at night this is converted into a striking illuminated advertisement that can be had in seventeen combinations of colour. In short, the words, when the arrangement is alight at night, will be constantly changing colour. This effect is obtained by a colour cylinder or disc which automatically revolves round the luminant. It is claimed that this is the only sign in existence that can be worked economically with gas, as one Welsbach burner does the whole thing. No winding up or lubrication is needed. The advertising matter can readily be altered, as well as the colour effects, at a very small cost. By using two or more lights, it is possible to obtain kaleidoscopical effects in large outside signs. The Company promise to shortly put on the market a gas-globe by which the same thing can be done.

Production of Metacresol from Crude Cresol.—A French patent taken out by the Chemie Fabrik Ladenburg is based on the fact that the normal calcium salt of metacresol is much less soluble in water or cresol than is the corresponding salt of paracresol. Crude cresol may be saturated with lime, the mass which separates filtered off, and decomposed with acids; relatively pure metacresol being obtained. If less lime be used (*e.g.*, an amount equal to that of the cresol employed), the resulting crystalline mass is freed from the mother liquor by washing with benzene, and is finally decomposed by means of acid.

Laying Mains under Water.—The work of laying a submerged main, at a depth of 86 feet, across the channel which separates Queenstown from Haulbowline, in Cork Harbour, has lately been completed. It was carried out from plans prepared by Messrs. Kirkby and Doran, of Queenstown, for the Queenstown Urban District Council, who undertook, at the request of the Admiralty, to give an ample supply of pure water to the dockyard of Haulbowline. When the Engineers first designed the work, it was thought by many experts to be impracticable, owing to the great depth of water in the channel, and because of the exceedingly irregular nature of the bottom, which chiefly consisted of hard jagged limestone rocks. The submerged main is about 2000 feet in length, and consists of specially cast 6-inch internal diameter ball-and-socket jointed pipes. The work was carried out by Messrs. Lester, of Plymouth.

TESTING GAS AND ELECTRIC LIGHTING FOR INDOOR AND OUTDOOR PURPOSES.

We have for some time past opened our columns to contributions and letters on the subject of the testing of incandescent lights, and the desirability of obtaining accurate and impartial figures as to the comparative value of gas and electric lighting for indoor and street lighting purposes. Makers of intensified gas systems and electric arc lights supply figures and estimates which are all very well in their way, but are not the same as results obtained by impartial experimentalists. The undertaking of a series of public tests, therefore, by the Westminster Electrical Testing Laboratory and Messrs. Simmance and Abady (to witness which those interested in gas and electricity will already have received invitations) seems to us to present the desired opportunity, and we have arranged that readers shall be informed weekly as to the progress of the tests, which are to extend until Christmas. Figures, however, will not be given weekly, but will be published *in extenso*, as a complete report dealing with the subject, at the end of the series of tests.

In our opinion, to make such tests reliable, the following points should be carefully borne in mind throughout: The fact that all the gas tests will vary as the calorific power and illuminating power of gas varies; therefore the quality of the gas and its calorific power will require careful examination and recording. Not only horizontal tests, but tests at all angles will be necessary if conclusive figures are to be arrived at as to the results of different systems of intensified gas, as in almost every instance a different mantle is used by each maker, and it appears, therefore, most likely that the various meshes employed in the weaving of the mantle structure should have a distinct influence on the direction of the light.

In such a short period of time as a month or six weeks, it is obviously impossible to test for the life of mantles; for, all will agree, a successive series of tests of a given mantle, continuing over a lengthy period—say, 2000 hours—is absolutely useless if, after each test, the mantle has to be removed from its support (or even if the burner complete, carrying the mantle, is removed from the photometer) and placed on one side between each test. Such handling is obviously unfair to the mantle. It will be seen that this means practically the devoting of one photometer to one mantle for 2000 hours; and we do not think that such a test is practicable with the class of photometers at present before the gas profession. We are encouraged to think, however, that the tests which are now in progress will evolve a method by which this difficulty can be overcome. Certainly, it should be possible for every gas manager to test mantles for life, as well as for light, before adopting a special make for his street-lamps; and if means for enabling this to be effected adequately can be brought forward, then, indeed, Messrs. Simmance and Abady will have rendered a distinct service to the cause of gas lighting.

The testing of the electric light also resolves itself into a question of life and light against cost; and the variations of filaments during their efficient existence, as well as the speed of carbon consumption in arc lamps, are both points that certainly require the closest investigation.

The measurement of current (and also the gas used in the gas tests) is a comparatively simple matter, providing that the instruments are properly verified and used by operators interested neither in the actual sale of gas nor in the actual sale of electricity. The subject is an extremely large one; and we are glad that it has been undertaken under such circumstances as will leave no doubt as to the accuracy of the results.

ELECTRIC LIGHTING MEMORANDA.

Mr. Pearce's Manchester Report Again—Portable Photometry not Absolutely Correct—Preferential Treatment for Public Lighting.

A fortnight ago, we passed certain criticisms on the report of Mr. S. L. Pearce, the Electrical Engineer to the Manchester Corporation, and on some editorial remarks made in the same connection by our estimable contemporary, the "Electrician." Ten days passed before the latter published a reply; the time having been occupied in calling for the aid of Mr. Pearce in the matter. The result is unfortunately rather remote from what may be described as convincing. There is, in the first place, a weakness about the reply to the strictures passed on the accuracy of tests obtained by the portable photometer. Our comments have had the effect of causing the "Electrician" to considerably dilute the former positive editorial statement. Nothing more definite or faith-reposing can be expressed by words than this: The portable photometer is an instrument "the accuracy of which *is beyond doubt*." But when we talk of the photometer, which the "Electrician" holds in as much respect as was Cæsar's wife of old, being used for penalty tests for electricity, and suggest that in such an event there would be quite another tale as to its veracity, our contemporary cries off with the remark: "This may be perfectly true, as the function of the photometer would then be entirely different. Instead of being employed for the purpose of making comparisons, in which case error cancels out, it would be used quite improperly for making an *absolute* measurement." How so? seeing that it is said to be an instrument whose "accuracy is beyond doubt." It will not do. Our electrical friends were obviously writing without having followed the perambulations of the portable photometer through the streets, and then made tests of the same lamps under conditions of scientific accuracy in which atmospheric conditions, situation, ribs of lanterns, dirty glasses, and several other things which do not cancel error, but rather emphasize it, do not interpose themselves between the actual lighting value of a lamp and the reading of the disc, and which invalidate comparisons. Between an arc lamp globe containing one source of light and a ribbed lantern containing two, three, or more mantles variously grouped, there is a vast difference, in getting the real illuminating value on to the disc of a portable photometer. But there, this is a matter which has been fully discussed before in the columns of the "Journal." If the "Electrician" cares for the references, we will gladly supply them, and then follow up any discussion of the matter our contemporary chooses to enter into—they taking up the defence of their statement that the accuracy of the portable photometer used in testing lamps in the street "is beyond doubt."

Mr. Pearce relies, for confirmation of the results of his tests in Manchester of the intensified gas-lamps, on Mr. Bradley's reports on the Westminster lighting. This is in effect an avowal of ignorance, and a want of care in investigating the subject. The high-pressure gas-lamps in Manchester are on the Keith system; those in Westminster on the Sugg system—with different burners, lanterns, probably mantles, a different quality gas, and consumed most likely at a different rate and supplied at a different pressure. Take the illuminating power alone. In Manchester, the gas is of an average power of 17·80 candles; in Westminster, it is about 16 candles. Mr. Bradley at Westminster, with the lower quality gas found (taking the figures given by Mr. Pearce) an average illuminating power of 573 candles; Mr. Pearce, with the 17·80-candle gas, could only make the intensified lamps in Manchester yield him a light of 525 candles. Unconsciously he has here supplied us with illustration of the unreliability of the perambulator photometer. Does the "Electrician" or Mr. Pearce want anything more luminous than this to show that portable photometers are not things of an accuracy "beyond doubt?" Mr. Pearce, our contemporary also states, "emphasizes the fact that mantles do deteriorate with great rapidity, resulting in tremendous diminution of illuminating power, although this diminution may only appear comparatively small to the naked eye." "Great rapidity" and "tremendous diminution" are terms denoting something alarming. Mr. Pearce is mistaken. If he will place himself in the hands of Mr. J. G. Newbigging, the City Gas Engineer, for a space of 1000 hours or upwards without running away, he will no doubt undertake to prove to him that his statement is not justified in the case of the best makes—and they are many—of mantles. It is more often than not that, excepting to the extent of a small percentage, the depreciation in the illuminating power of incandescent gas-lights is due not so much to the mantle as to the fact that the burner requires a little attention in the way of cleaning; but that attention does not correspond in magnitude to what is required by electric arc lamps.

It is, however, on the question of the cost per unit for the electricity supplied for public electric lighting that Mr. Pearce is most at home, and likewise our contemporary, under his sheltering wing. The figure that was quoted by Mr. Pearce for electricity for public lighting, it will be remembered, was 0·95d. per unit; and we gave a number of figures from the last year's analysis of the accounts of the Manchester Corporation Electricity Department to show the unfairness of taking this low figure. Marvellous to relate, Mr. Pearce tells us now that this 0·95d. per unit includes not only depreciation, but interest, sinking fund, and management charges. Truly we are getting to a remarkable point; and if it were not that we prefer—to the juggling with load-factors and other figures to make up a plausible case—to see how the electricity accounts come out at the end of twelve months, we should with this 0·95d. per unit, including depreciation, interest, sinking fund, and management charges, begin to fear for the future of the gas industry. But no such fear disturbs us, or is likely to. We are not of those who do not think that a large and constant customer should have special terms; and we will grant that the public lighting may be supplied at a lower, so long as it is a remunerative, rate. But we cannot concede that public lighting in the case of electricity should have preferential treatment over all other classes of demand. Electricity costs, we are told, vary enormously with the rate at which it is produced; and that therefore such a load as arc lighting should receive specially favourable terms. For Manchester 0·95d. per unit has been suggested! To follow the argument of Mr. Pearce to its logical conclusion, the Electricity Department of Manchester are taking from the Tramways Department too much in the price of 1·49d. per unit; for surely the tramway supply is a greater and more constant load than arc lighting. It is a curious line of reasoning to adopt, that public lighting should be placed in a better position than the supply for tramway and power purposes. The tramways in Manchester (judging from sleepless hours there) start running at something like five to six o'clock in the morning, and continue until after midnight. That means a constant heavy demand through the day. Power supply, too, comes mostly in the day time; and it should receive greater

consideration than the night demands. Then in the evening, in addition to the traction supply, there is private lighting. One would suppose that the evening and night demand for private, shop, and industrial purposes would be heavier than for public use in Manchester; and therefore why public lighting—each lamp being regarded as a separate consumer requiring its separate supply—should receive greater indulgence in the matter of price than the tramways and so much more than the private consumers, we cannot see. It is a supply in effect to scattered individuals—principally at the same hours as during private consumption. So far as we can find, there are only five municipal authorities out of the total possessing electricity supply works—Belfast, Bradford, Hull, West Bromwich, and Nuneaton—who furnish the public lamps with electricity at under 1d. per unit. Why is this? Why is it that the bulk of municipal authorities charge the public lighting nearer—many well above—the 2d. at present charged in Manchester, than the proposed 0·95d.? And why is it that Belfast, Bradford, Hull, and West Bromwich have gone in so largely for incandescent gas lighting, and do not make, so far as we can learn, further attempts at displacing it? Are the 135 local authorities who charge between 1d. and 4·52d. per unit for public lighting all fools, or is Manchester more capable of administering its electricity undertaking than the others? This is rather a long string of questions, but they will turn up.

MUNICIPAL INDEBTEDNESS.

Two speeches made under widely different circumstances quite recently emphasized the lesson on which we have often insisted—that it is time to call a halt in local expenditure. Sir Henry Fowler, M.P., at a gathering at Wolverhampton, and Mr. J. Spencer Phillips, presiding at a meeting of the Institute of Bankers, both said in effect the same thing—that we are spending public money too fast and that it is necessary to retrench. Naturally, they approach the matter from different standpoints. Sir Henry Fowler's view is that of the economist who wants to see a reduction in public expenditure all round. To men of his temperament and training, the great and increasing outlay upon national armaments is a matter of real concern. How little hope there is of effecting any great economy in this direction, or perhaps in any portion of the national expenditure, the events of the past few weeks only too clearly show. In regard to local expenditure, things are obviously different. There no question of outside pressure arises. The expenditure for the most part is purely voluntary. Given certain necessaries, the chief of which are pure water, good lighting, and efficient drainage—the community may dispense with much else without being the worse for it. No one who knows his record will accuse Sir Henry Fowler of want of sympathy with municipalities or municipal enterprise. His advice may, therefore, command a hearing which would be denied to counsel less sympathetic. It is that the corporations should stop spending public money on launching out new schemes, and be content for the present to develop those already in hand. Having regard to the manner in which some of the municipal schemes now in hand absorb capital, it would certainly seem that there are in their development abundant means of outlay for all the money which they will be easily able to raise under the present circumstances.

Mr. Spencer Phillips, as the Chairman of Lloyd's Banking Company, approaches the subject from a totally different point of view. His standpoint is that of the banker, who has to consider, first, the influence of increasing municipal debt upon the Money Market, and, secondly, the effect which certain methods of raising money adopted by municipalities may have on banking as a business. Although the enormous increase of municipal indebtedness is a matter of common knowledge, it is not always realized that the burden is growing out of all proportion to the means of bearing it. Since the year 1875, municipal debts in England and Wales alone have risen from £92,000,000 to £350,000,000, and the annual charges on account of the debt from £19,000,000 to £48,000,000; while the rateable value of property has gone up only from £115,000,000 to £174,000,000. To the bankers, the most important consideration is that this borrowing on the part of municipal authorities has the effect of keeping all high-class securities at a low level; while it adversely affects commercial enterprise, and thus restricts the volume of banking business. This point was recently dwelt upon by another banker of large experience—Mr. Felix Schuster, the Chairman of the Union of London and Smith's Bank. In his opinion, the uneasy conditions of the Money Market are mainly due to the excessive borrowings by local authorities, and, among other things, have interfered with the success of Government loans.

In regard to another branch of the question, these financiers also hold the same opinion. They both regard with doubt and distrust the effect of the intrusion of municipalities upon the domain of private commercial enterprise. Mr. Phillips spoke sarcastically of the fourteen or fifteen industrial enterprises directed by certain corporations, and of such proposals as municipal music halls and municipal steamboats, on which the loans of the corporations are being frittered away. It is this kind of thing which has practically closed the Money Market to the municipalities, and brought them into direct competition with the bankers, in inviting money on deposit. This is an aspect of the question which, in Mr. Phillips's opinion, affects the commercial community equally with the bankers, because it means that if the savings of the people are diverted into the municipal coffers, the banks will no longer have at their disposal those funds on which so many traders draw to carry on their business.

From all these points of view, the matter demands consideration; and the time is no doubt approaching when Parliament will be called upon to deal with it. Mr. Phillips appears to be hopeful of the benefit which would result from Government audit of municipal accounts; but it will need much more than such an audit to restrain the excessive borrowing which is the root mischief of the whole business. There is no doubt that in the past the banks themselves have helped rather than hindered the corporations in the spending of money. It is pointed out, in the current issue of the "Incorporated Accountants' Journal," that although banks are now looking with a suspicious and jealous eye upon the financial operations of corporations, they once took a much more benevolent view of their relations to such bodies. There was a period when municipal corporations were enabled to raise temporary loans by means of bank overdrafts, pending the issue of redeemable stock, without any difficulty whatever. The time when even the Bank of England was ready to enter the lending arena is past; and corporations cannot now get money on their own terms, as once they could. But there is still the prospect that the piling up of debt will continue. If money cannot be obtained in one way, it will in another; and Socialist fads will continue to find advocates, and be carried out to the detriment of the real interests of the community, unless Parliament should have the courage to put a check upon such enterprises. What is immediately necessary is, as Sir Henry Fowler says, to put a stop to the spending of money on new schemes. If "wake up" is, as we all believe, the best of mottoes for Commercial England, "pull up" is certainly not less necessary as a rule of conduct for Municipalities.

Rotary Meter Syndicate and Marsh and Thorp's Specialities.—We note that the Committee of the St. Louis Exhibition have awarded a Gold Medal for Thorp's instruments of precision—one of which is calibrated to show 14,000 lines to the inch. In the same connection, it may be mentioned that the Rotary Meter Syndicate, who established themselves to carry out experiments in connection with their meters—having completed them, made great headway with the station form of meters, and are now introducing the discount meter—have made arrangements to issue a limited amount of capital.

Manufacture of Cyanides from Sulphocyanides.—According to an English patent taken out by Herr J. Tcherniac, of Freiburg, a solution of a sulphocyanide mixed with dilute nitric acid is heated, and a current of air passed through the mixture, slightly in excess of the proportion required by the equation $HSCN + O_3 = HCN + SO_3$. The gases are led through a tower, in which any nitric oxide present is removed by a stream of water or of dilute nitric acid, and are then, after passing over anhydrous sodium sulphate, led over sodium carbonate or hydroxide, heated to about 450° C. to form a cyanide nearly free from cyanate. In a later English patent, he has described his improved method. It is directed to pass the washed gaseous mixture, containing hydrocyanic acid and nitric acid vapour, over a salt or oxide (such as anhydrous sodium sulphate or alumina) which reacts or combines with the nitric acid, but has little or no effect on hydrocyanic acid. The absorption of this is effected by an alkali hydroxide heated to a temperature below its melting-point, but above that at which the water generated by the reaction is completely vaporized. In using caustic soda for this purpose, it is first heated to about 200° C., and finally to about 300° C.

Carborundum Coatings for Gas-Retorts.—A report has recently been issued by the Company entitled "Feuerfeste Industrie," of Düsseldorf, upon the use of carborundum for coating, or for mending cracks in, gas-retorts. Carborundum is the silicon carbide (Si C) made by fusing coke and silica together in an electric furnace. It is an extremely hard material, very difficult to decompose, highly refractory yet an excellent conductor of heat which may be mixed with fire-clay or waterglass to form a "paint" or "putty" that resists great or sudden changes in temperature without yielding. A syrupy paste made from carborundum, water, and either fire-clay or waterglass may with great advantage be employed to form a coating about 0·5 millimetre thick on both the outside and inside of coal-gas retorts. It adheres well, and protects the retorts excellently. A similar paste may also be used to stop any cracks in retorts. In one of the largest gas-works of Germany, a couple of retorts which were cracked and leaky were stopped with a paste composed of equal parts of carborundum and fire-clay and the necessary quantity of water. The cracks were made good while the retorts were still hot; and three minutes' time they were ready to charge again. Subsequent tests proved the retorts to be perfectly tight; and they remained in use three months without needing any further attention till the furnace containing them was pulled to pieces. When it is desired to apply the carborundum paste to a red-hot article, the agglutinant must be fire-clay of good quality; but when the paint is to be employed cold, it may be composed of three parts by weight of carborundum and one part of waterglass. Coke-ovens may be coated, or repaired, in the same fashion.

GAS SUPPLY OF THE PARIS SUBURBS.

The New Company.

In a paragraph which appeared in a recent issue of the "Journal," it was stated that the French Company for the Manufacture of Meters and Gas-Works Plant had obtained a contract for the equipment of the new works which are being erected at Gennevilliers for the Paris Suburban Gas Company, the circumstances attending the formation of which have already been mentioned in our columns. It will doubtless be remembered that the concession of the existing Gas Company will expire at the end of next year, when the supply of gas to the city will be taken over by the Municipality. Provision had, however, to be made for a continuation of the service in the Suburban Communes; and this has been ensured by the formation of a separate Company. Particulars concerning the new undertaking have appeared in a French financial paper; and the reproduction of some of them may be of interest.

The Company was formed last year, with a nominal capital of 1,200,000 frs. (£48,000), which was considered to be amply sufficient to meet the initial expenses, and furnish the guarantee required by the administrators of the affairs of the various communes concerned. The preliminary negotiations were soon concluded, and contracts were signed between the parties, and sanctioned by the Prefects of Paris and the Department of Seine-et-Oise respectively. Thereupon, at an extraordinary meeting held on Nov. 24 last year, the capital of the Company was increased to 25,000,000 frs. (£1,000,000), in 100,000 shares of 250 frs. each. The Company have a concession for a period of 30 years, from Jan. 1, 1906, to supply gas in 63 Suburban Communes, which at the last census contained 790,241 inhabitants; and they secure to themselves the exclusive right to lay down, maintain, and utilize, under the public roads, the necessary mains and pipes for the distribution, for lighting, heating, and motive power, of "gas extracted from coal and enriched by the bye-products of the distillation thereof, or by oil gas." Each commune reserves to itself the right to supply electricity or any of the other sources of light, heat, and power; but it gives preference, other things being equal, to the Company in regard to all lighting systems requiring underground pipes. The Company will take over, in the condition in which they are at the commencement of the concession, all mains, pipes, syphons, and other plant and accessories, upon communal territory, become the responsible owners thereof, and maintain them at their own cost.

As already mentioned, it is specified that the gas is to be made from coal, enriched by means of the residual products of distillation. It would thus appear that carburetted water gas will not be tolerated. This, however, is not the case. Admixture of the coal gas with oil gas or with water gas will be allowed, but only after consultation with the Council of Hygiene, and special authorization by the Communal Councils. If, as the result of the advance of knowledge, communes supplied from the same works consider it advisable to call upon the concessionaries to adopt new methods which will have the effect of reducing the net cost of gas, the latter will have to comply with their orders, provided the methods referred to have been successfully employed for two consecutive years in a French commune of at least 10,000 inhabitants. Should the proposed changes involve the construction of special plant, it will have to be paid for by a deduction from the annual profits of such sum as will pay it off, with interest at the rate of 4 per cent. Half the financial benefit realized after this deduction is to go into the communal exchequer. These stipulations, however, will not come into force until the concession has been running for ten years; and in the event of a new process being then adopted, no other improvement is to be ordered before the expiration of a further ten years—in other words, not until the third decade of the concession.

The price to be charged for gas used for public lighting is 15c. per cubic metre (3s. 4½d. per 1000 cubic feet); and during the first 20 years of the concession the lamps, pillars, and brackets will be supplied by the Company. To ordinary private consumers the price of gas for all purposes will be 16c. per cubic metre (3s. 7¾d. per 1000 cubic feet); but in the case of small houses, where the Company put in gratis a prepayment meter and three burners, with the necessary piping, the price will be increased by 4c., bringing it up to 20c. per cubic metre, or 4s. 6⅓d. per 1000 cubic feet. The ordinary consumers will have to pay the cost of fixing their meters; the amount being determined according to their hourly delivering capacity. They will also be charged 5d. per month for the use of the meter and the maintenance of the service-pipe. The rising mains attached to the houses will, at the end of the concession, become the property of the freeholder, subject, however, to the payment by the latter, during the last ten years of the concession, of the portion of the initial expenses remaining unliquidated. As in the case of the city, the Company will have to pay each commune a tax of 2c. per cubic metre (5½d. per 1000 cubic feet) for the use of the subsoil and whatever pipes may belong to the communal authorities. But when the quantity of gas used in the public service exceeds 500,000 cubic metres (about 17¾ million cubic feet) per annum it will be 3c., and when it is above 1 million cubic metres (35½ million cubic feet) the figure will be raised to 4c. per cubic metre, or 8d. and 11d. per 1000 cubic feet respectively. While the communes thus benefit by the increased business of the Company, they are not to be allowed to derive further revenue from them by imposing fresh dues, or raising those for which they are liable, during the term of the concession. At its close, all the distributing plant and the material used in the public lighting service will pass over to the communal authorities without the payment of any indemnity to the Company.

At the present time the attention of the Company is directed mainly to the construction of their new works at Gennevilliers—the peninsula in the Seine so well known in connection with the works for the treatment of the Paris sewage. The site chosen is by the river side, upon the line about to be constructed by the Northern of France Railway Company from Ermont to St. Ouen-les-Docks; so that the raw material will be conveyed into the works at a cheap rate. The works will be equipped with all the latest improvements, and will be capable of producing profitably the increasing quantity of gas required by the growing populations in the suburbs of Paris. The existing capital is estimated to be adequate to meeting the present demands; and subsequent requirements will be met by the issue of debentures. But it is confidently believed that the undertaking will be well able to furnish a remunerative return on all the capital invested in it. In the actual state of the gas industry in France, the cost price of gas per cubic metre (35·3 cubic feet), inclusive of all working expenses except the annuities on the loans and the town dues, is probably not more than 8c., or at the rate of 1s. 9¾d. per 1000 cubic feet. At all events, this was the figure taken by M. Dehaynin as the basis of his estimate which was accepted by the Municipal Council of Paris in connection with the discussions on the gas question; and it is borne out by the last accounts of the Paris Gas Company. The net cost of a cubic metre of gas in Paris last year was below 8c.; but the new Suburban Company, with their modern plant and favourable position, will be able to produce it for rather less than this. Adding the 2c. per cubic metre of gas sold which they will have to pay to the authorities, the figure will still be under 10c. Now, as already mentioned, the selling price per cubic metre is 15c. for public lighting, less 2c., 3c., or 4c., as previously explained; 16c. for private consumption, which will be the largest part of the business; and 20c. for the small consumers on the prepayment system, who will necessarily become very numerous in the suburbs of Paris. The profits may therefore be estimated at 6c. per cubic metre of gas sold. The consumption of gas exceeds 31 million cubic metres in the 63 communes in which the Company's operations will be carried on—as a matter of fact, it was 31,073,290 cubic metres, or about 1095 million cubic feet, last year. A net profit of 6c. per cubic metre on 31 millions would be nearly 2,000,000 frs. (£80,000), or 8 per cent. on the existing capital. Of course, there will be the debentures on which interest will have to be paid; but it is estimated that the loan capital will not be very large.

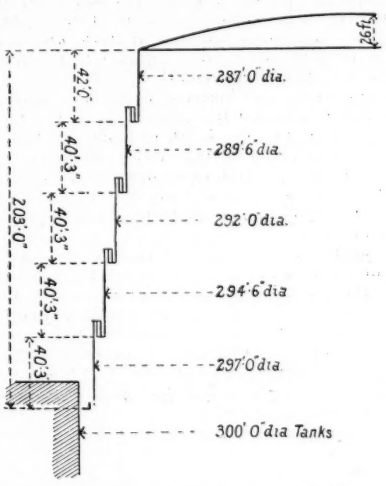
Looking into the future, the writer of the article predicts uninterrupted prosperity for the new Company. During the first years of the concession, it may be expected that the development of business will be very rapid. The suburbs are extending, and the population is growing at a good rate. The average consumption of gas is rather low, being in 1901 about 39 cubic metres (1378 cubic feet) per inhabitant per annum. It varied from nearly 90 cubic metres (3178 cubic feet) at Neuilly to 7·5 cubic metres (265 cubic feet) at Gennevilliers. The last-named place, however, is not particularly attractive as a residential suburb of Paris, compared with the one previously named, or with Asnières or St. Germain; and this may account for the low consumption of gas. This will, of course, improve when the new works are in operation. Then the reduction in price may be expected to greatly stimulate the use of gas. In Paris, the drop from 30c. to 20c. per cubic metre caused an increased production of gas to the extent of 7·62 per cent. last year. In the suburbs, the prices chargeable until the end of 1905 are not less than 30c., and in certain communes 45c. per cubic metre, or 6s. 9¾d. and 10s. 2½d. per 1000 cubic feet. When, in rather more than another year, the 16c. rate comes into operation, a considerable rise in the consumption may be looked for, as housekeepers will be more liberal in the use of gas. On the whole, therefore, the new Company will, we think, start their works and enter upon their career with every prospect of success.

Continuous Lime-Feed to Ammonia Stills.—In the "Journal für Gasbeleuchtung" (Vol. XLVI., p. 375) there is given a description of Kordt's automatic lime-feed for use in the distillation of ammoniacal liquor. It is in use at the Düsseldorf Gas-Works, giving a continuous automatic supply of milk of lime to the Feldmann distilling column, where it has effected a considerable increase in the amount of the ammonia gas obtained from the liquors. It consists of a tilting vessel, mounted over the milk of lime reservoir, and is made to rock by the introduction of water in small quantity. The movement is transmitted to the plunger of the lime-pump and to an agitator at the bottom of the lime-vessel. The speed of the pump is so adjusted, by regulating the water supply, that the liquor leaves the still almost free from ammonia. A head of water of 6½ feet is sufficient to work the apparatus, and the consumption is 1½ cubic metres, giving 120 to 150 strokes of the pump per hour.

THE GIGANTIC GASHOLDER FOR NEW YORK.

SEVERAL correspondents have called attention to an evident discrepancy between the dimensions given in the "JOURNAL" for the 8th inst., as those of the new holder that Mr. Bradley is erecting at the Astoria works, New York, and the capacity mentioned, of 20 millions. The figures were—as stated at the time—given on the authority of Dr. A. H. Elliott, one of Mr. Bradley's staff, who was speaking from memory only and without notes of any kind. Pending the receipt of further particulars from New York concerning the new works, it will be well to set this matter, at all events, right. For this purpose, Mr. F. S. Cripps has kindly worked out for publication what would be the actual storage room of the holder on the assumption that the particulars already published are correct—viz., that the holder is a five-lift one, 42 feet each lift, and working in a 300 feet diameter tank.

Mr. Cripps writes: Taking this as correct, the diameter of the outer lift cannot well be more than 297 feet; and the inner lift cannot exceed 287 feet. Hence the mean diameter would be 292 feet, as set forth on sketch herewith. The depth of the sides totals up to not more than 203 feet, as shown. Taking,



then, the above-mentioned figures, we get: Area of 292 = 66,966 square feet, which multiplied by the depth 203 = 13,596,000 cubic feet capacity—not 20,000,000 as mentioned. It will be noted, Mr. Cripps adds, that nothing has been allowed for the crown of the holder, as this is not effective. The capacity stated is the "working capacity." If the crown be included, it would add another 289,000 cubic feet only, assuming the excessive rise of 26 feet.

This figure of 13,596,000 cubic feet capacity is thus only 1,396,000 cubic feet above the working capacity (12,200,000) of the large holder at East Greenwich, and brings the figure nearer to that given in the "JOURNAL" last year, June 9—viz., 15 million cubic feet. It was however then stated that "further consideration may produce some modification" in this respect.

THE GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 637.)

THE improved tendency on the Stock Exchange which we noted in our last issue did not pursue the even tenor of its way in the week just closed. The opening was rather slack; and there was a disposition to realize profits. Gradually the feeling became more and more sensitive; and when at last on Thursday a London paper sounded an alarm (apparently of French make) regarding our negotiations with St. Petersburg, the markets took fright most readily. However, reassurance very rapidly supervened; and the close was calm. The chief feature of the week was the immense demand for the new Japanese loan. In the Money Market, the tendency at first was all in favour of greater ease. The supply was abundant; but it hardened later on, and closed firm. Discount rates were steady. Business in the Gas Market was active in the earlier portion of the week; but it became lighter towards the end, and it was to a great extent centered in the stocks of the Metropolitan Companies. Changes inquotation were very few indeed in number; and they were almost wholly confined to the Suburban and Provincial group. In Gaslight and Coke issues, the ordinary was freely dealt in at prices which were fractionally easier than the general run of figures for the preceding week. It opened at 94½; and on Wednesday it once touched 93½, which was the lowest figure marked. Then it began to improve again; and on Saturday 94⅝, the best price of the week, was attained. Of the secured issues, the maximum changed hands at from 90 to 91; and it looked as if the quotation might have been advanced. The preference ranged from 107½ to 108¾, while the debenture stock was steady at 88½. South Metropolitan was strong and active. Opening at 127¼, it quickly ran up to 129, and many bargains took place at these figures; but for some reason or other the nominal quotation was left unchanged. Of Commercials, a good deal more stock has recently come into the market, and has been readily taken up at quotation figures. Here, again, it would seem as if the nominal prices would bear revision. In the Suburban and Provincial group, business was at low pressure; but the tendency was very buoyant, and several issues advanced their quotations—to wit, Bournemouth, Brentford, Brighton, and West Ham. No business at all was marked in Brentfords, and only one bargain in Bournemouth. Brighton original was done twice at 215, and West Ham once at par. South Suburban figured at 119¾ and 119. Hastings changed hands at 92, and Tottenham "B" at 99. The Continentals were rather quiet. Imperial ranged from 206 to 207½, European part-paid from 14¼ to 14⅜, and Union from 103½ to 105; the latter being a "special" bargain. Among the remoter undertakings, there were no movements in quotations, and transactions were not very heavy. Buenos Ayres was dealt in at 11½ and 11⅝, River Plate at 11¾, and San Paulo at 12 and 12¾. Primitiva had another quiet week. The ordinary changed hands at 5$\frac{11}{16}$, the preference three times at 4$\frac{13}{16}$, and the debenture once at 95—the top quotation.

The closing quotations are shown in our stock and share list.

PERSONAL.

In the article on "The Gas Manager and Engineer in Local Government" which appeared in the "JOURNAL" for the 25th ult., it was mentioned that Mr. W. R. COOPER, of Banbury, was one of several gas managers who were doing good work as municipal councillors. We are pleased to learn that Mr. Cooper was raised to the high position of Alderman on the 9th inst.

After a four months' trial, Mr. WILLIAM FIELDEN has been appointed Works Manager to the Staines and Egham District Gas Company; the post being vacant on the 25th of July, consequent on the retirement of Mr. Thomas Webb, after 31 years' service with the Company. Mr. Fielden, who served under Mr. Webb, is the holder of a first-class Honours certificate of the City and Guilds of London Institute; and he has been with the Company three years. He has now the whole of the manufacture and distribution under his control. The make of gas is 125 millions per annum.

In the "JOURNAL" last week we briefly recorded the relinquishment by Mr. F. W. HIMING of the Secretaryship of the Continental Union Gas Company. Mr. Himing entered the Company's service in 1864, and was appointed Accountant three years later, and Secretary in 1887, as mentioned last week, on the resignation of Mr. H. Johns. His connection with the Company closed at the end of September last, to the great regret to the Board, who were pleased to grant him a suitable retiring allowance, as a mark of their appreciation of the many valuable services rendered by him during his association of more than forty years with the Company, and of his untiring devotion to its interests.

In the list of new Mayors connected with gas or water supply given in the last number of the "JOURNAL," there should have been included the name of Mr. WILLIAM HART, J.P., of Derby, who for many years has been a Director of the Ogley Hay and Brownhills Gas Company and the Spondon, Ockbrook, and Borrowash Gas Company. Mr. Hart is a Fellow of the Institute of Chartered Accountants, and Shareholders' Auditor to the Derby Gas Company. Another name inadvertently omitted last week was that of Alderman SIDNEY FLAVEL, who on the 9th inst. was elected for the sixth time Mayor of Leamington. He is Chairman of the Flavel Range and Imperial Stove Company.

Most people who are familiar with the history of gas lighting are aware that in France it is PHILIPPE LEBON, not William Murdoch, who is regarded as the discoverer of the means of producing illuminating gas from coal for general use. Lebon, it may be remembered, came to an untimely end. He was found on Dec. 4, 1804, murdered in the Champs Elysées, at a spot near the site of the present Grand Palais, which formed so conspicuous a feature of the Exhibition of 1900. We learn that, in memory of this tragedy, and with the view of paying due honour to the inventor of the illuminant in which they are so greatly interested, the Paris Gas Company have arranged to supply a certain quantity of gas, free of charge, to the Aëro Club and the Société Française Aërienne; and ascents will be made on the 4th prox. by members of these societies.

It may be remembered that the Birmingham City Council, at their meeting on the 31st ult., decided to confer the freedom of the city upon Alderman LAWLEY PARKER, in recognition of his eminent services to Birmingham, and particularly as Chairman of the Water Committee during a period of ten years. At the same time there was a widespread desire that such an honour should be supplemented by the presentation of a personal testimonial, in the promotion of which the city generally could participate. After the Council meeting, a private gathering of the members took place, when a Committee was formed to consider the best way in which the views of the Council and of the citizens

could be carried into effect. As the Committee understood that such a course would be acceptable to Alderman and Mrs. Lawley Parker, it has been resolved that the presentation should take the form of a portrait in oils for the city and a replica to be given to Mrs. Parker.

OBITUARY.

It is with much regret that we learn of the recent death of Mr. WALTER JOHN ARLISS, for forty years Chief Accountant of the Crystal Palace District Gas Company. Mr. Arliss was well known in the Company's district and greatly esteemed.

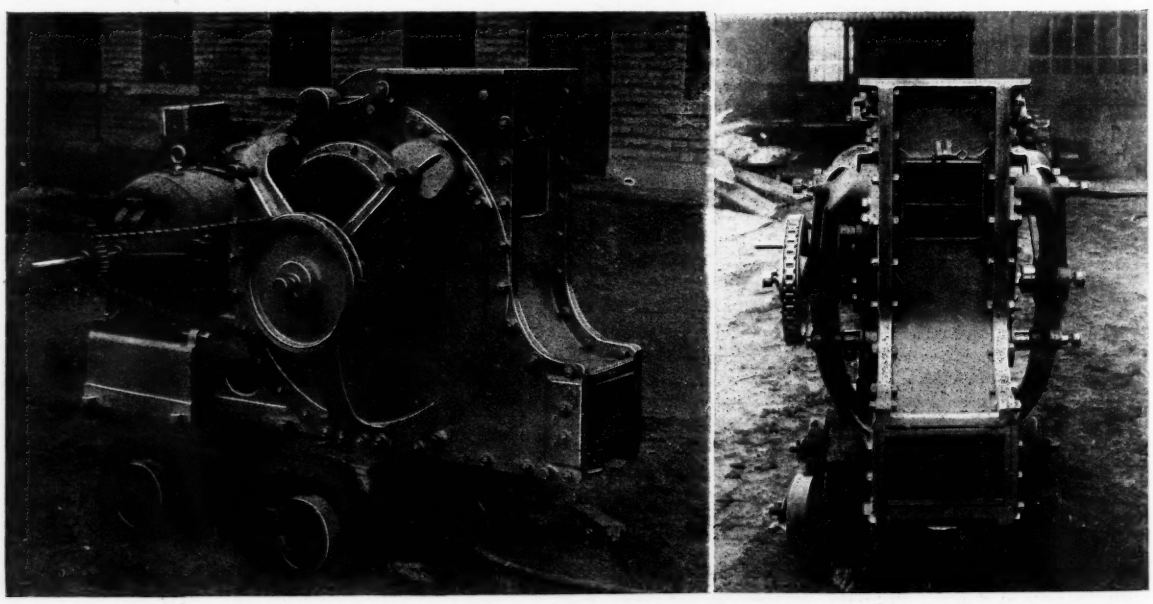
We greatly regret to record the death last Tuesday, as the result of blood poisoning following a cycling accident, of Mr. ERNEST L. NEWBIGGING, the youngest son of Mr. Thomas Newbigging, of Manchester. Deceased, who was only 29 years of age, was Gas Engineer to the Macclesfield Corporation—a position he obtained on the appointment of his brother, Mr. J. G. Newbigging, as Chief Gas Engineer to the Manchester Corporation, early in 1900. Up to this time he had been engaged in the office of his father, with whom he served his articles. The funeral took place on Friday. We add our own to the many expressions of sympathy which have been conveyed to Mr. Thomas Newbigging and the family in their bereavement.

We regret to learn that Mr. PETER WATSON, who for 33 years was Manager of the Stirling Gas Company, died at his residence in that town last Wednesday morning. He was a native of Falkirk, where he learned gas making. In 1864, he was appointed Manager at Stirling, in succession to the late Mr. John M'Nie, who died in Londonderry a few years ago. Mr. Watson remained Manager till seven years ago, when he retired, receiving a pension from the Company. When he took up his duties, the annual make of gas was very small; but at the time he retired it had risen to 60 million feet per annum. When he gave up active business, the members of the North British Association of Gas Managers showed their esteem for him by electing him one of their honorary members. Mr. Watson is thus the second of that select class who has been removed by death within the past few weeks; the other being the late Mr. G. T. Myers, formerly of Broughty Ferry. Mr. Watson had reached the age of 82 years. He was twice married, and is survived by his widow and a large family, two of whom are gas managers—Mr. Peter B. Watson, at Newton Stewart, and Mr. Mountain B. Watson, at Stranraer. The funeral took place at Stirling last Saturday. As was fitting in the case of one of the respected veterans of the profession, it was largely attended by his former colleauges and others with whom he had business connections. Among those present, besides his own family, were his successor at Stirling—Mr. J. D. Smith; Messrs. R. Cowie, of Tillicoultry (son-in-law); P. B. Watson, of Wishaw (nephew); J. M'Gilchrist, of Dumbarton; W. B. M'Lusky and R. S. Carlow, of Perth; and J. Hepworth and Andrew Mackenzie, of Edinburgh. Besides these there was a large turn-out of the townspeople, including the leading men of the place.

Ex-Bailie ARCHIBALD, of Leith, died at his residence in that town on the morning of Friday week, at the age of 77. He was a native of Menstrie, in Clackmannanshire, and in his early manhood he engaged in business in his native town as a woollen manufacturer. In 1852 he emigrated to Australia, to try his fortune in the goldfields. After a year, however, he returned to Scotland, and three years later started business as a baker in Leith, and continued it till the last. A man of shrewd commonsense and a well-endowed intellect, he early began to take part in public affairs. With the exception of two very short periods, he was a member of the Leith Town Council from 1866 till 1895, and was at one time asked to become Provost, but declined the office. His special sphere in municipal work was that of the water supply. He was a strong advocate of the St. Mary's Loch scheme, and, as a promoter, was one of those who were ordered to pay the costs of the promotion, amounting to about £19,000. But when the Edinburgh and District Water Trust was formed, a clause of indemnity was inserted in the incorporating Act of Parliament, which relieved the promoters of the burden. Mr. Archibald was elected by the Leith Council as a Water Trustee, and remained a member of the Trust till 1902. From 1888 onwards he held the position of Convener of the Works Committee; and in that position did much valuable service to the community. In all the work of looking out for an additional water supply, from 1890 onwards, he may be said to have been the leading spirit. He was one of the chief promoters of the Manor scheme; and when it was dropped, he took up the Talla scheme with the same vigour, and was more successful. He was the chief operator at the ceremony of cutting the first turf of the Talla works in 1895. He was one of the original members of the Gas Committee, and remained with them till he retired from the Town Council. In 1895 he was presented with a portrait of himself and a cheque for £600, together with a diamond ring for Mrs. Archibald, "in recognition of his long and faithful services to the burgh, the Edinburgh and District Water Trust, and other Commissions."

DEMPSTER AND SONS' PATENT CHARGING AND DRAWING MACHINES.

(TOOGOOD'S PATENT.)



Yet another retort charging and discharging machine falls to be described this week; and it is one that will certainly attract much attention at the Earl's Court Exhibition. The Elland firm have secured the sole rights of manufacture under the Toogood patent—No. 6882, [March 22, 1904. In the accompanying illustrations, figs. 1, 2, 3, and 4, the actual machine alone is shown; the whole of the framing, traversing, and hoisting gear having been purposely omitted so that readers may the more readily understand its action and construction.

In general appearance, the machine partakes of a turbine or fan design; but here the similarity ends—their action being entirely different, as will be seen from the description. The blades A are threaded on the mandril B, so that they can rotate independently. The mandril passes through the centre-line of the body of the machine; hence the blades are radial. The blades are kept in their relative positions by the slotted trunnions C, through which they slide. The trunnions, in turn, are secured to two rings D, in such a manner that they can oscillate to suit the varying inclination of the blades. The segments E are bolted to the rings D, and form the tread of the drum for the coal to rest on. The drum revolves on the flanged rollers F, which are

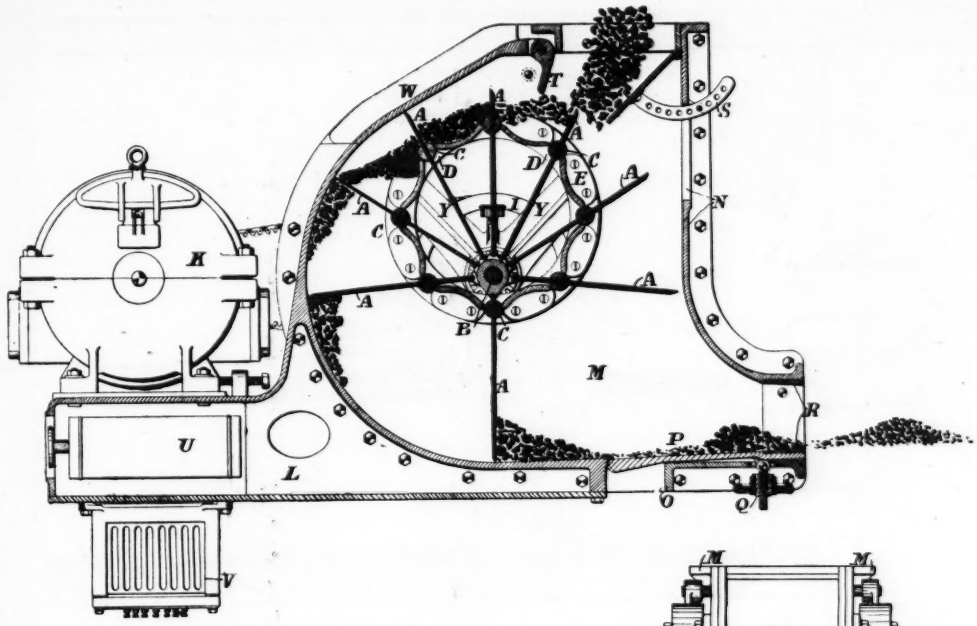


FIG. 1.—LONGITUDINAL SECTION OF CHARGER.

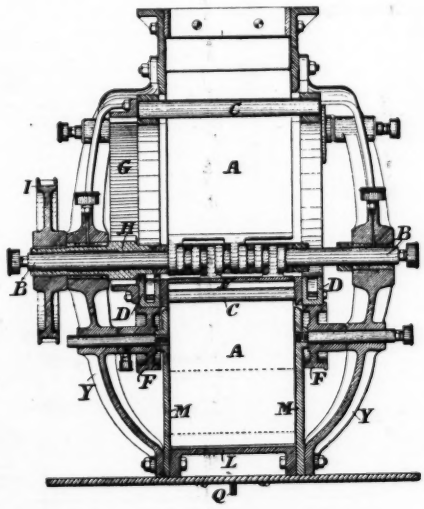


FIG. 2.—CROSS SECTION OF CHARGER.

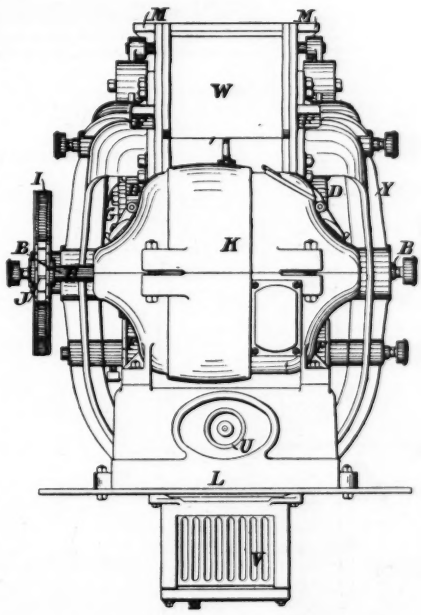


FIG. 3.—END ELEVATION FROM BETWEEN CHARGER.

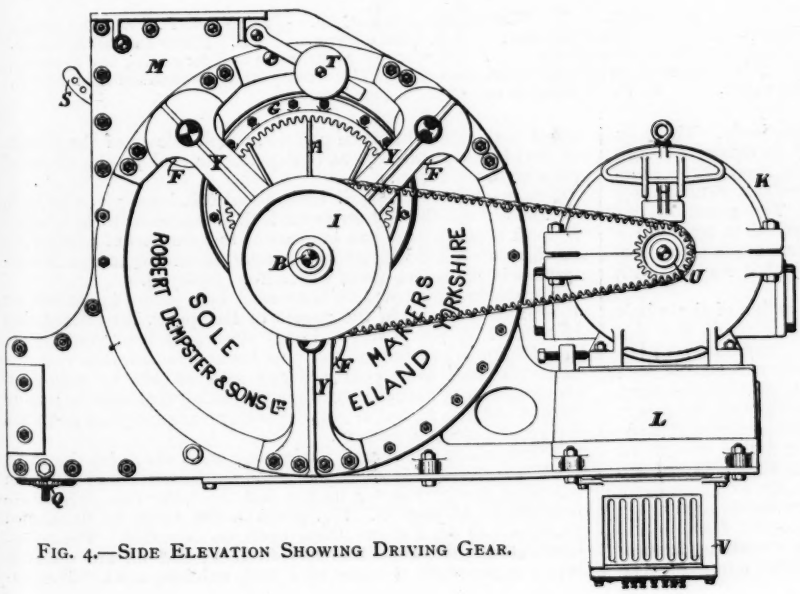


FIG. 4.—SIDE ELEVATION SHOWING DRIVING GEAR.

A. Blades threaded on mandril, to revolve independently of each other.
B. Mandril quite free to revolve or remain stationary while the machine rotates.
C. Slotted trunnions through which the blades slide.
D. Rings to carry the trunnions C.
E. Segments to connect the rings D.
F. Flanged rollers for the rings D to run on.
G. Internal toothed wheel bolted to one ring D.
H. Pinion gearing with G, and having a sleeve to form a bearing.
I. Chain wheel for Hans Renold silent chain, keyed to the sleeve on the pinion H.
J. Chain pinion on the motor.
K. Electric motor.
L. Cast-iron base for the motor.
M. Side plates of the motor.
N. Front plate.
O. Bottom plate.
P. Hinged bottom for elevating the stream of coal.
Q. Handwheel for raising P.
R. Throttle plates at the mouth, to throw dust particles into the stream of coal.
S. Adjusting quadrant for the feed.
T. Flap to adjust the depth of coal between the blades.
W. Inspection door.
U. Controller for the motor.
V. Resistances.
Y. Y shaped arms for carrying the outer ends of the shafts and the pins of the rollers.

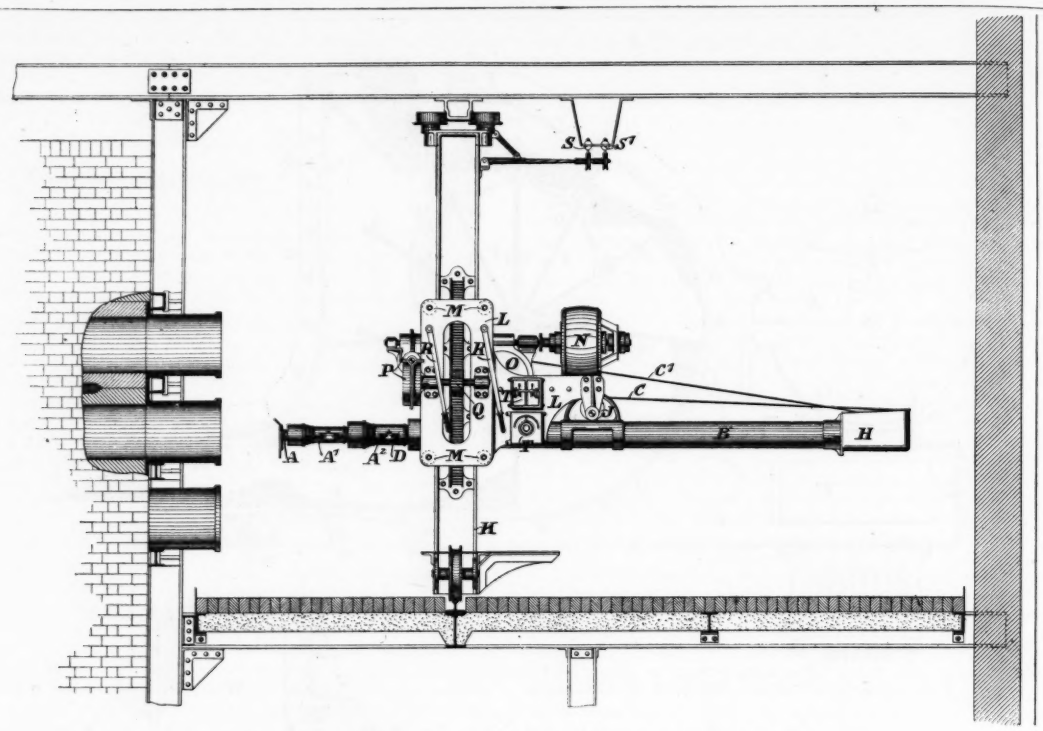


FIG. 5.—SIDE ELEVATION OF DISCHARGER, WITH RAM CLOSED.

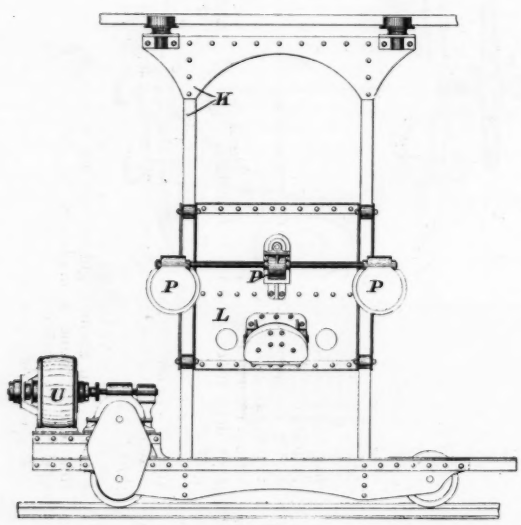


FIG. 6.—FRONT ELEVATION LOOKING FROM RAM HEAD.

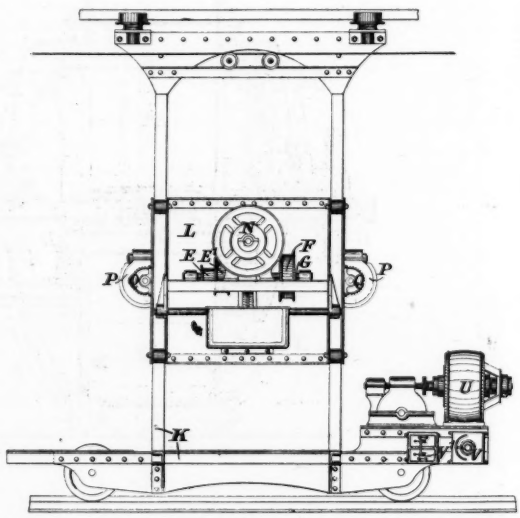


FIG. 7.—BACK ELEVATION LOOKING FROM WATER BOX.

A, A1, A2. Ram tubes. B. Casing tubes. C, C1. Wire ropes. D. Wire rope attachment, &c. E, E1, and F. Winding drums. G. Shaft for the winding drums. H. Water box. J. Eccentric gear. K. Main frame. L. Rising and falling frame. M. Rollers. N. Motor. O. Worm gear-box to the winding drums. P. Worm gear-boxes to the rack for raising and lowering. Q. Rack pinions. R. Clutch levers. S, S1. Electric supply and return wires. T, T1. Controller and switch for the motor N. U. Traversing motor. V, V1. Controller and switch for the motor U.

supported by bosses and pins from the machine body. The gear wheel G is bolted to one of the rings D, and is driven through gearing by an electric motor K, at a normal speed of 80 revolutions per minute. The centre of motion of this drum is $5\frac{11}{16}$ inches above the centre of the mandril B. The result of this method of driving is that the blades are caused to travel at a varying speed—being suitable at the top to receive the coal without breakage, and at the bottom to project it forward with sufficient velocity to charge the retort.

Referring to the longitudinal section, the action of the whole machine will be seen to be exactly comparable with that of a sling—that is, the coal is fed between the comparatively slow moving blades, the speed of which is gradually accelerated in a downward direction, thus utilizing the force of gravity, and slinging or projecting the coal at a high velocity into the retort. It will be observed, the patentee remarks, that centrifugal force is not generated on the machine; hence "the coal is not ground to a powder at the circumference, and a great saving in friction and power is obtained." This is obvious from the slow running of the machine—only 80 revolutions to charge a 20 feet through retort. The speed can be increased to 100 revolutions, and decreased to 60 revolutions, by the controller U; and this variation allows of all classes of coal being projected. A further adjustment is provided in the hinged bottom plate P, which allows of the stream of coal being elevated so as to deposit the coal in the required position in the retort.

The machine is of small bulk, about 6 ft. long, 3 ft. 9 in. high, 3 ft. wide; and the makers say it is their intention to fit it either to work beneath overhead bunkers or to form part of a travelling machine complete with its own hopper, according to the circumstances in the retort-house where it is employed.

The discharging machine is covered by a patent taken out on July 22 (No. 16,223) in the names of Dempster, Broadhead, and Ordish. Like the charger already described, it presents many novel features; and as it has now been demonstrated that the coke resulting from coal charged into retorts by means of machines, more particularly of the projecting type, can be readily pushed out of a 20 feet retort, the makers are sanguine as to the future of their arrangement.

The machine consists of a telescopic ram, which (as shown by the illustrations) is in three tubes, the smallest being $2\frac{1}{2}$ inches in diameter, the next one 4 inches, and the outer one $5\frac{1}{2}$ inches—marked A, A1, and A2. Fig. 5 shows the tubes in the closed position, and fig. 8 shows them open or extended. The tubes, when closed, telescope into one another; and all are received into a casing tube B made of $\frac{1}{4}$ inch weldless steel. The ap-

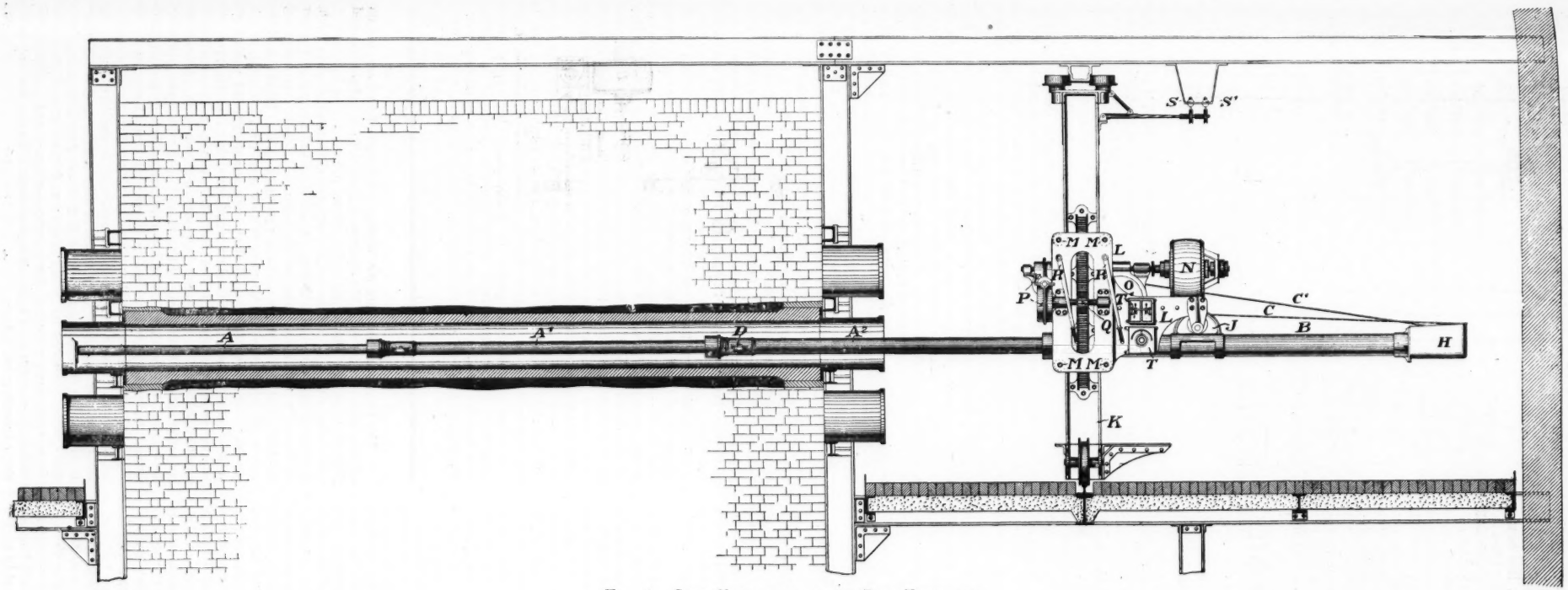


FIG. 8.—SIDE ELEVATION, WITH RAM EXTENDED.

pliance for working these tubes in and out (which the patentees prefer, out of several methods described in their patent specification) consists of $\frac{1}{4}$ inch galvanized flexible wire ropes C, C^1, threaded as follows: Take, for instance, the rope for pushing out the tube A^1. This rope has one end fixed at the point D on the head of the tube A^2. The rope then goes over a pulley at the back end of the tube A^1 and over a jockey-wheel at the other side of the tube A^2, opposite the point D, and from there to the winding drums E on the shaft G, fig. 7. The other two tubes are worked in practically the same manner, except that the rope to the smallest tube is fixed at each end, and does not require to be wound in, as its necessary outward motion is imparted by the travel of the tubes A^1, A^2.

For closing the ram, it is only necessary to have one straight rope, which is fixed to the back end of the smallest tube, and goes direct to the winding drum F. This rope is marked C^1. The ropes C are for extending the rams. One of the features of this machine is that, with this rope arrangement, each tube opens and closes at the same time—viz., say when the ram has extended or closed to any portion of its stroke, each of the tubes will have travelled the same amount. This gives the tubes plenty of length of bearing to steady them when doing the hardest work—viz., when starting to push out, and, really, until practically the whole of the coke is out. Further, the whole of the ropes and gear are entirely enclosed from the retort; and the telescopic tubes are entirely emersed, and flooded in water. The open water-box H fitted at one end, and packed glands fitted to the ends of the tubes, form stops to prevent the water from leaking. Further, in connection with these tubes, the casing tube B is swung by trunnions from the frame L of the machine near the front end of the tube B, and is also provided with eccentric gear J, to elevate the tubes for compensating the slight sag of the tubes, and thus relieve the bottom retorts of any weight. This apparatus would also be used when drawing coke, instead of pushing it, so as to carry the head clear of the coke into the retort.

With regard to the general construction of the frame and driving gear, it will be noticed that the main frame K, for traversing the machine along the house, is of simple design, and supported both the top and bottom, so as to take the canting motion of the ram—usually overcome by utilizing a very heavy base. On the frame K is a second frame L guided by four rollers M. The whole of this second frame is made free to travel up and down in the uprights composing the frame K. The rams and driving gear, also the raising and lowering gear, are all attached to it, and consist of a reversible electric 4-horse motor N, with a worm-gear drive, enclosed in the casing O to the winding drums already mentioned. The motor shaft, which is extended through the frame L for driving the worm gear, is enclosed in the casing P. The worm gear is for working the rack pinions Q for raising and lowering the ram to the required tier of retorts to be discharged. The two worms and the motor shaft for driving the winding drums and rack gear are provided with claw clutches, and levers R, these being necessary on account of only having one motor for the two operations—viz., working the rams and raising and lowering them.

The motive power for the machine is obtained from the trolley wires S, the second wire S^1 being for the return current. The necessary reversing and speed controllers T, T^1 for the motor are shown at the side of the machine. The second motor U is for traversing the machine; but "it is not anticipated that this will really be necessary, and may be looked upon more as a luxury." This motor is provided with separate controller, &c., V, V^1, but it receives and returns the current by the same trolley wires as for the motor N. The arrangement of the machine is such that the whole of the controlling gear is on one side of the machine, and within easy and comfortable reach of the attendant.

Messrs. Dempster and Sons have not up to the present time had an opportunity of trying the machine in actual work; but they claim the following advantages for it, which they think actual experience will confirm: Simplicity and compactness; low horse power required; few working parts exposed to the heat of the retort; minimum wear and tear; tubes are water-cooled inside and out, after each stroke, without water pressure inside the tubes; the ram does not rest on the retort bottom, as with most other machines; the machine combines the duties of either pulling out or pushing out the coke; it can be adapted for either through retorts or stopped-end retorts; it can be designed to go into any retort-house, however narrow; the machine will be fitted with automatic electric cut-outs working at any part of the stroke, and coming into operation if there should be any obstruction in the retort when drawing or pushing—thus preventing damage to the retort.

THE ACTION OF THE INCANDESCENT MANTLE.

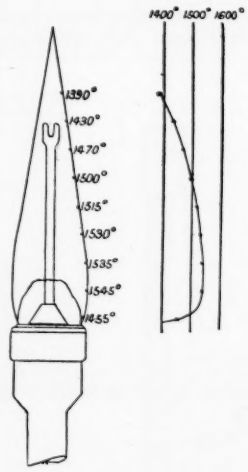
By Dr. H. Bunte.

A paper on this subject was read last year before a meeting of Chemists in Berlin by Dr. H. Bunte, of Carlsruhe. It has now been published in the "Journal für Gasbeleuchtung;" and the following abstract translation is made therefrom.

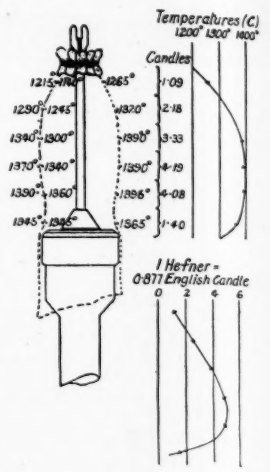
The invention of the Welsbach light, which amazed the world in 1886, had five years later practically reached finality. It was then recognized that the best mantles consisted of pure thorium oxide with about 1 per cent. of cerium oxide; and at the present time all the mantles used are made of this so-called Welsbach mixture. In the course of the last year or two, considerable improvements have been made in respect of the illuminating power, constancy, and durability of mantles. Only thorium and cerium nitrates are of practical importance among the so-called lighting salts. The feebly illuminating skeleton of pure thorium oxide can indeed be rendered fairly illuminating by the addition of small quantities of other radiants, such as platinum, iridium, &c.; but such mixtures are only of scientific interest, and have no practical significance. The expectation that other rare earths would be applicable for mantle manufacture has not been fulfilled. The chief raw material for the preparation of thorium and cerium salts is monazite sand, which occurs in vast quantities on the gold fields of Brazil and Carolina. Unfortunately, thoria, which forms the bulk (99 per cent.) of the mantle, comprises scarcely 4 to 5 per cent. of this sand; while upwards of 50 per cent. of ceria is present in it. There remains, therefore, a large excess of cerium salts, for which so far a profitable use has been wanting. The production of "lighting salts" has attained such dimensions in Germany that it is now equal to about 100 million mantles per annum—that is to say to about 220,000 lbs. of the salts, extracted from about 25,000 tons of monazite sand. The greater part of the German production is for export.

It is of the utmost importance for the production of durable, highly illuminating mantles, which shall retain their shape and intensity, that a suitable fabric should be used for absorbing the lighting salts, and that the mode of burning off and the shape of the mantle should be appropriate. Considerable advances have been made by the substitution of ramie thread for the cotton web at one time commonly used, and by the adoption of mechanical appliances for burning off. The use of artificial silk, which at one time seemed hopeful, has, however, not succeeded on the large scale, because the mantles made therewith were too costly. Chemists and physicists have of late years debated vigorously the cause of the high illuminating power of the thoria-ceria mantle. Baron von Welsbach has attributed the luminescence of the mantle, apart from the heating by the bunsen flame, to the chemical action of the flame gases. In 1896, Killing explained it through the catalytic effect of the mantle; and experiments made by the author have supported this view. That is to say, a rise of temperature, and therewith an intense radiation of light from the mantle, is brought about by the quickening of the combustion on the mantle. Le Chatelier, and, later, Nernst and Bose, concluded, however, from their researches that the high illuminating power could be explained solely by the selective radiation of the mantle at the temperature of the bunsen flame, and without any chemical participation of the mantle in the combustion process. Latterly Drossbach and Killing, Féry, and White and Travers have studied the question experimentally, and have expressed views thereon, inclining some in one direction and some in the other. Finally, the Imperial Physical Technical Institute at Charlottenburg, by its important work on the laws of radiation and the measurement of high temperatures by photometry, has done much towards throwing light on the matter. Eitner and Schmidt have also, under the author's direction, made researches on it, of which a brief account may be given here.

The accompanying illustrations show the results of measurements made by Dr. Eitner of the distribution of temperature and illuminating power in the naked bunsen flame and in the zone of the mantle. The temperatures were measured thermo-electrically, and are relative, and not absolute, values. It will be seen that the temperature of the naked flame is considerably higher



Temperature. Degrees Fahr. of the Naked Flame.



Temperature and Illuminating Power of the Welsbach Mantle.

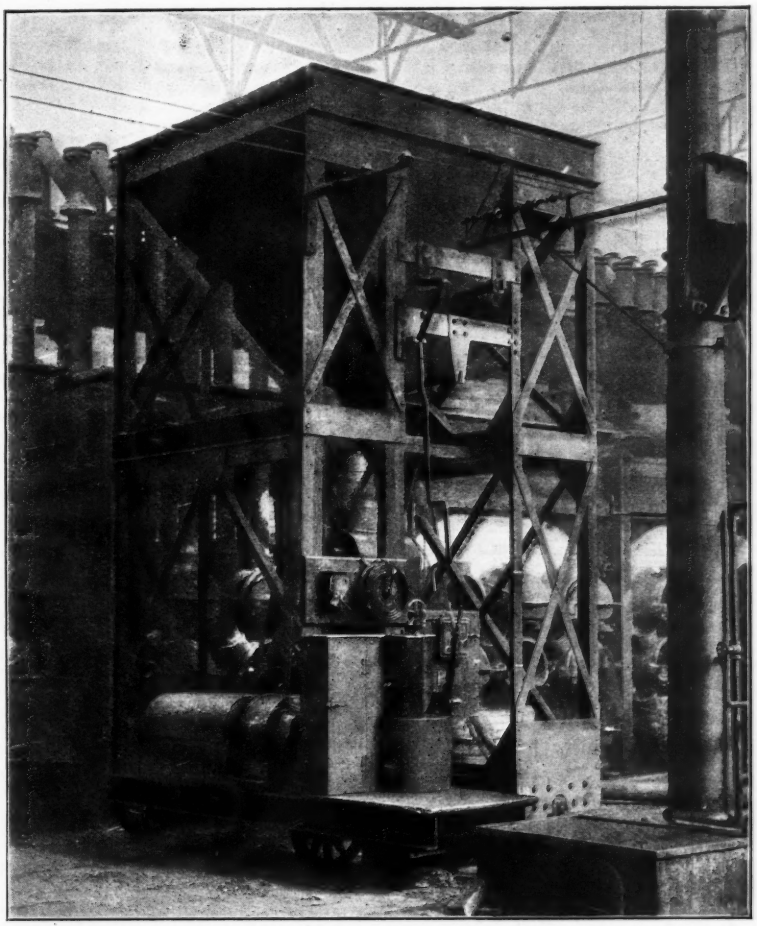
than that of the mantle for the same spots, so there is no considerable rise of the temperature of the mantle due to catalytic action of the material; while the close correspondence of the curves of temperature and light distribution likewise speaks against any such action. Herr Schmidt has carried out spectrophotometric investigations of thoria-ceria mixtures of varying composition at different temperatures. They showed that pure thorium oxide will send out a more and more blue light as the temperature rises; while cerium oxide on a thoria skeleton maintains the same colour at all temperatures. When gradually increasing proportions of cerium oxide were added, the light was perceptibly bluer as the temperature and illuminating power rose, until a proportion of about 0·5 per cent. of cerium oxide had been reached. Then the red rays and the illuminating power increased until the cerium oxide amounted to 1·5 per cent. Further increase in the proportion caused the colour to approach more and more nearly to that of incandescent neat cerium oxide, and the illuminating power to decrease. Unlike pure thoria, after a certain temperature has been attained, the light-emitting power becomes nearly the same for all colours when the temperature is increased. As the mass or weight of the mantle is increased, the red rays if it increase at the expense of the blue.

All these phenomena point to a selective radiation of the material of the mantle, as suggested by Le Chatelier and Nernst and Bose—that is to say, the mantles radiate like coloured bodies in consequence of the high temperature imparted to them by the flame. The author desires explicitly to state that these later experiments have led to this conclusion, because formerly he ascribed considerable influence on the radiating power to the chemical participation of the mass in the phenomena of the combustion—that is to say, to its catalytic action. According to the present position of the researches, the thorium oxide must be regarded merely as a carrier for the particles of cerium oxide, and the latter as the light givers or radiants. The cerium oxide attains its high temperature in the flame in virtue of its distribution and its small amount, and its lighting effect is mainly a consequence of the selective radiation.

The Estate of the Late Mr. Willey.—Probate has been granted of the will of the late Mr. Henry Alfred Willey, which is dated March 5, 1904. The gross value of the estate is £91,841, and the net value £79,538. The testator appointed his wife (Mrs. Emilie Louise Willey) and Mr. William Cash as Executors and Trustees of his will, and guardians of his infant children. He expressly wished that, subject to certain provisions, his Trustees should retain all his shares in Messrs. Willey and Co., Limited, as long as might be practicable, and that such shares should not be sold unless there should be absolute need for doing so. In pursuance of the powers vested in him by the Articles of Association, he nominated Mr. F. Templar Depree, of Exeter, to succeed him as Director and Chairman of the Board of the Company, provided he should, within three calendar months after the testator's decease, have acquired ordinary shares of the Company of the nominal value of not less than £10,000. He is to retain these offices as long as he holds this qualification, and is entitled to a salary of £1000 per annum. The testator also authorized his Trustees to sell to Mr. Depree, at their stated value, a sufficient number of his ordinary shares to qualify him; and they can, if they think fit, permit any portion of the purchase-money, not exceeding two-thirds, to remain as a loan, at 6 per cent. interest, for any period not exceeding ten years.

THE "D. B." PATENT COAL PROJECTOR.

With Self-Contained Coal Supply and Electric Propelling and Hoisting Gear.



To those who become acquainted with the "D. B." patent coal projector in its simple form, as exhibited at the International Gas Exhibition, the machine shown in the accompanying illustration will come as a surprise. All the same, this illustration also represents the projector; but here it is combined with a large overhead receptacle for carrying its own supply of coal. This receptacle, or hopper, has a carrying capacity equal to 5 tons of coal, or sufficient to charge from 12 to 15 through retorts, each 20 feet long. There is a measuring chamber placed underneath the hopper for accurately measuring the charge for each retort, and the outlet and inlet are so controlled that when the hand lever is in the extreme position one way the top door is open. In the mid-position, both doors are shut; and in the other extreme position, the bottom or outlet door is open. Thus one lever does the whole operation; and the parts are so arranged that only one of the doors can be open at one time, and neither can move from its closed position until the other is completely shut. The projector hangs in the space between the two main uprights of the frame, and is guided by turned bars which keep it rigidly in position. Horizontal swivel-pins, controlled by a hand-wheel, allow the projector to be tilted up or down in the vertical plane to meet the varying conditions due to the age of the retorts. The whole machine runs on four wheels, which are geared by means of machine-cut tooth-wheels to a totally enclosed dust-proof motor for propelling the machine in front of the retorts or to and from the central storage hopper for a fresh supply of coal. The reversing gear for running the machine in either direction consists of a tramway-type drum controller with metallic resistances giving five speeds in either direction; the slowest being only a few feet per minute, so as to enable the machine to be stopped exactly where required.

The hoisting of the projector to positions suitable for charging any retort is accomplished by the moving of a clutch, which disconnects the propelling gear from the motor, and connects the hoisting gear. The whole of the gear is contained in a covered-in box or bed-plate on one side of the machine near the motor, and is thoroughly protected from dirt and dust. The reversing controller and the other mechanism for manipulating all the motions are fixed in convenient positions above the platform on the left-hand side of the machine.

The particular machine from which the illustration was prepared is in operation at the Addison Street Gas-Works, Blackburn, where the electric arrangements have been erected by Mr. S. R. Ogden, the Corporation Gas Engineer. The first machine of this type was installed at the Walsall Gas-Works about twelve months ago, and was shown by the Engineer (Mr. B. W. Smith) to the members of the Midland Association of Gas Managers on the occasion of their annual meeting in October last year. Since that time, however, several minor improvements have been made, and at present no less than eight machines of this type have been, or are being, installed.

Machines with self-contained coal supply are in themselves much more costly than the simple form hanging from an overhead carriage, as originally introduced; but there is usually a very considerable saving in coal-handling plant, which makes the whole installation, including the self-contained machine, work out cheaper in first cost. The simple machine hanging on chains has the beauty of extreme simplicity; and for small retort-houses it is certainly the best. But English gas engineers have never been wholly pleased with this scheme, probably because of the large machines for the same purposes to which they have become accustomed. It is therefore interesting to learn that Messrs. W. J. Jenkius and Co., Limited, have made no less than five types during the past year to meet the wishes of the gas industry. First, the hanging machine as originally erected at Derby; next, the self-contained machine as now illustrated; then a machine consisting of a projector carried in a light frame with electric propelling and hoisting gear for running on rails in the retort-house floor, and to be supplied with coal from continuous hoppers and fixed measuring chambers in the retort-house; then the same machine as that just described, but having a measuring chamber of its own, and taking its coal from overhead continuous hoppers; and, finally, a machine fitted with a measuring chamber and small hopper to take coal from several detached hoppers in the retort-house.

It should be noted that, wherever the discharging-machine is intended to be employed, a framed projector to run on rails on the floor of the retort-house is almost always used, because the same rails suit both machines. The electric gear for propelling is so simple and so little liable to get out of order that there seems to be no reason, except for very small retort-houses, why the whole of the work should not be done by power, and thus reduce to a vanishing-point the exertion required from the attendants.

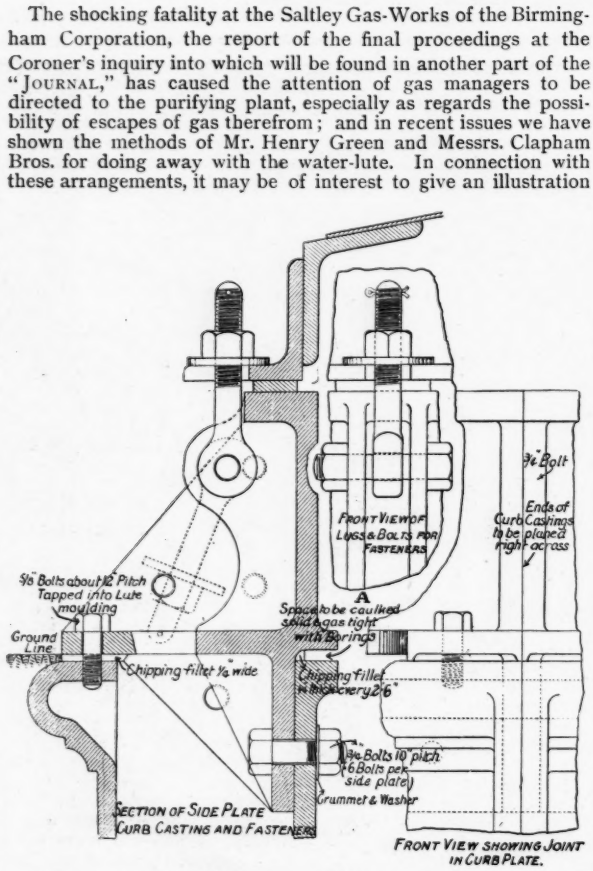
Other interesting features are about to be introduced into the projector, as we learn that machines are now being made to charge larger coal and lumps of cannel up to 3 inches long. Many gas engineers dislike their coal broken small; and they, at least, will be interested in the new developments.

Society of Engineers.—The Jubilee of the Society was celebrated by a *conversazione* last Wednesday, at the Royal United Service Institution, Whitehall. The visitors, who numbered about 420, were received by Mr. D. B. Butler, the President, and Mrs. Butler; and the interesting museum was thrown open to their inspection. The band of the 22nd Middlesex Rifle Volunteers was stationed in the gallery; and vocal music was rendered in the lecture theatre by the Imperial Glee Singers. During the evening, a lecture, entitled "Japan and the Far East," illustrated by lantern views, was delivered by Mr. G. A. Goodwin, a Past-President. The Society has on its roll 555 members and associates.

Air Gas Supply on the Continent.—A recent number of the "Journal de l'Acétylène" contained some particulars in regard to the supply of air gas at Rhinow (Prussia). The gas is used for lighting, cooking, heating, and the production of motive force. There are 23 Auer street-lamps, of 50-candle power; and 110 houses are served. The charge is 5s. 8d. per 1000 cubic feet; a 50-candle burner costing, it is stated, only about 0·05d. per hour. Air gas is consequently cheaper than petroleum; but it is only suitable for small places, where ordinary coal-gas works would not pay for their installation. It was found that in a certain town the estimate for works of this kind was £6000; whereas others for the supply of air gas were put up for £2600. The gas does not require any special system of distribution. At Rhinow there are about two miles of mains. The largest air-gas works are those at the Breslau Maternity Hospital at Herrnprotsch. They supply 2000 burners, each of 50-candle power.

DRY JOINTS FOR PURIFIERS.

The shocking fatality at the Saltley Gas-Works of the Birmingham Corporation, the report of the final proceedings at the Coroner's inquiry into which will be found in another part of the "JOURNAL," has caused the attention of gas managers to be directed to the purifying plant, especially as regards the possibility of escapes of gas therefrom; and in recent issues we have shown the methods of Mr. Henry Green and Messrs. Clapham Bros. for doing away with the water-lute. In connection with these arrangements, it may be of interest to give an illustration


⅝" Bolt
Ends of Curb Castings to be placed right across
FRONT VIEW OF LUGS & BOLTS FOR FASTENERS
⅝" Bolts about 12" Pitch Tapped into Lute moulding
A
Space to be caulked solid & gas tight with Boring
Ground Line
Chipping fillet ½" wide
Chipping fillet in thickness 2/6"
⅝" Bolts 10" pitch (6 Bolts per side plate)
Grummet & Washer
SECTION OF SIDE PLATE CURB CASTING AND FASTENERS
FRONT VIEW SHOWING JOINT IN CURB PLATE.

of one designed by Mr. F. S. Cripps nearly four years ago, when, so far as he is aware, it was the first of the kind that had been made. There is, of course, nothing novel about the rubber joint or fastener. The chief features of the design are the attachment of a separate casting so as to get a good grip of the lute-plate, the caulked joint at A to assist in making it gas-tight, the filling of the lute with sand in order to make a solid job, and the readiness with which it can be fixed—narrow chipping-pieces being cast on to facilitate bedding the casting. We are pleased to be able at this juncture to give Mr. Cripps's design, with the foregoing brief explanatory remarks.

JUNIOR INSTITUTION OF ENGINEERS.

The Opening Meeting of the present session of the Institution was held at the Westminster Palace Hotel last Friday, and there was a good gathering of members. Mr. J. Fletcher Moulton (the retiring President) occupied the chair at the commencement of the proceedings. The minutes having been read by the Secretary (Mr. Walter T. Dunn) and confirmed, he read the names of additional new members. Among them was that of the new President (Mr. W. H. Lindley, M.Inst.C.E., F.G.S.), and also that of Mr. Leonard Körting, of Hanover—the latter having been elected an honorary member. The Institution's premium of the twenty-third session was next presented to Mr. A. W. Young, for his paper on "The Design of a Dry Dock." Mr. S. Cutler, jun., then proposed a vote of thanks to Mr. Moulton for his services during the past session. He referred to the benefit the Institution had derived from Mr. Moulton's association with it, to the cordial reception the members had met with in their visit to Germany in the summer as the result of that association, and to the great future before it. He also alluded to the services rendered by Mr. Moulton on the Civil Service Commission, on the Board of Trade Departmental Inquiry on the Testing of London Gas, and in connection with the Metropolitan Water Arbitrations, as well as to his paper on "The Trend of Chemical Industry" read at the recent meeting of the Society of Chemical Industry, and abstracted in our columns last week. The motion was seconded by Mr. F. R. Durham, who impressed upon the members the value of a knowledge of foreign languages. Mr. Moulton, in acknowledging the vote, emphasized the remarks made by Mr. Durham. He then introduced his successor, who delivered an interesting address (illustrated by elaborate diagrams) on "Municipal Engineering on the Continent," of which the following is an abstract.

After thanking the Institution for the honour they had done him by electing him President for the current year, and alluding in a few appropriate words to the services rendered by Mr. Moulton, he proceeded to deal with his subject under four heads: (1) Water-works; (2) sewage works; (3) electric lighting; and (4) various other works confided to the municipal engineer, such as harbour works, the elaboration of designs for the extensions of towns, &c. He asked to be excused if he based his address to a great extent on the personal experiences of his father and himself, as they had stood for the last sixty years in the midst of this development. At the same time he thought it would be more interesting to the members to be informed of the motives for the adoption of one or another system, than to have a mere compilation of statistical facts.

Water-Works.—The President explained that the first works for water supply as well as the first sewerage works were those of the city of Hamburg. They were designed and carried out by his father, William Lindley (after the great fire in the city in 1842), under the influence of English works of like nature. He showed how this influence continued in the works that were planned in the forties and fifties—the Berlin Water-Works designed by Mr. Moore in 1853-6, and the Altona works designed by Mr. Thomas Hawksley in 1857-9. He gave a short description of these works, based on the supply taken from rivers with settling-tanks and filters, and described the special precautions adopted to suit the Continental conditions—in particular, the depth of the piping, the adoption of covered reservoirs, and the constant in contradistinction to the intermittent supply.

The President went on to show the gradual development of these works due to the utilization of the special sources of supply available on the Continent: (*a*) The first development of the supply from underground water in Leipzig, in the years 1858-65, under Herr Dost, executed on a small scale; and the subsequent comprehensive studies and works carried out in 1877-84 by Herr Thiem. (*b*) The works carried out by Herr Salbach in Halle in 1867-9, and in Dresden in 1870-4, likewise based on the supply of underground water. (*c*) The works of the same nature designed by the President's father in 1868 for the supply of Düsseldorf. He described the Berlin works, commenced in 1874-7 by Mr. Henry Gill for the supply of the city with underground water from the banks of Lake Tegel; the appearance of algæ and iron, which necessitated replacing this supply of water drawn direct from the lake and filtered; and the further large extensions of the works from this lake and the Muggelsee, up to 57 million gallons a day, with a filter area of 1,600,000 square feet.

Mr. Lindley showed how the difficulties caused by the iron in the water found in the great Northern German plain were gradually overcome by various systems of deferrization, so that an immense source of supply of first-class pure and cold water was made available and used for the supply of various cities. Thus Herr Beer, the present Engineer of the Berlin Water-Works, could return to the original designs of 1874 for the supply from the lake of Tegel, and extend the same to the supply from the Muggelsee, replacing the filtered water by underground water, and using the filters to clarify the deferrized water. The city of Magdeburg, hitherto supplied with filtered river water from the Elbe, is now replacing it by underground water.

The President then went on to describe the works carried out by himself for the supply of Frankfort-on-the-Main with underground water collected in the city forests. [These works were visited by the members of the Institution in August last.] He gave a description of the means adopted for finding the water, ascertaining the quantity available, and the system of laying out the works; and he mentioned the advantages of this source of supply. He then proceeded to refer to the development of filtration on the Continent, the adoption of filters vaulted in, the automatic arrangements for regulating purposes, and especially the very low rate of filtration, and the hygienic results obtained; and, lastly, he gave an account of the Berlin and Warsaw Water-Works.

Referring to the influence of the great outbreak of cholera in Hamburg in 1892, and the work of the Royal Cholera Commission in Berlin in 1893, in which he took part, the President showed on a diagram that of 138 towns and cities of Germany with more than 20,000 inhabitants, 55 per cent. are supplied with underground water, 30 per cent. by springs or springs and underground water together, and 15 per cent. by springs and filtered river water, partially supplemented by underground water and partially by impounded surface water.

The President next mentioned the systems adopted in Germany and Russia for the normalization of pipes, fittings, and water-meters, and explained the system carried out under his direction for furnishing a supply of water partly gratis and partly at a low price to the poorer classes in Germany, Russia, and Roumania.

Sewerage Works.—Passing to the second heading of his address, the President gave a description of the former state of drainage of Continental cities by means of street gutters, ditches, and old sewers. He had prepared a series of diagrams showing the development of water and sewerage works on the Continent; giving the increase of population, the percentage of houses supplied with water and drained to sewers, the supply per head of the population, and the decrease of mortality from typhoid fever, following more or less parallel with the gradual extension of the works. It was interesting to notice how the death-rate from this cause, which was in some instances 100 to 120, and even 200, per 100,000 inhabitants, had declined to 20, 10, and even less. While

Mr. Lindley admitted that this decrease might be in part explained by other causes.

Electric Lighting.—The President then passed on to the third division of his address—the supply of towns with electric energy. He pointed out that the commencement was made in 1885 by the establishment of the Berlin works, which have now attained a capacity of 61,000 kilowatts, producing 100 million kilowatt-hours per annum. These works were followed by those at Elberfeld, in 1887, which constituted the first municipal electric supply station. Both these stations were conducted on the continuous current system. The works at Frankfort were next described. They were first designed by Mr. Lindley in 1889, when Professor Kittler and he, in their report, proposed the adoption of the alternating current. The great fight of continuous *versus* alternating current which ensued gave rise to the Electrical Exhibition in Frankfort in 1891. The question was then again treated by Herr Oscar von Millar and Mr. Lindley in 1892, resulting once more in the recommendation of the alternating current, which, after a controversy extending over 4½ years, was adopted by the city authorities. The main lines of the Frankfort system are high tension, small loss of potential, low-tension service network transformers in underground chambers in the streets, large generating units, the whole supply in one circuit, cheap prices for current used for motors, and everything done to meet the whole demand from one source, and also to drive the tramways in conjunction with the supply of current for lighting and general power.

The President next described the Elberfeld works. These two examples were chosen because both the Frankfort and Elberfeld works were visited on the occasion of the summer excursion of the Institution. The works were extended on the alternating current system in 1898 under Mr. Lindley's direction, and according to his plans. The further developments were as follows: The tension was raised from 3000 to 4000 volts; the tension in the primary feeders of the network was lowered to 2½ per cent. and in the secondary network to 1⅓ per cent., thus allowing large quantities of energy to be supplied at any point of the district without injuriously affecting the tension and the light. One of the most interesting points in connection with the Elberfeld works was the adoption of the Parsons steam-turbine in large units of 1250 kilowatts. Mr. Lindley laid stress upon the great economy obtained thereby, and showed by means of a diagram the really marvellous extension which has taken place in the use of these machines. On another diagram, based on the statistics of German electric engineers, the development of central stations in Germany was depicted. It showed the gradual increase in the output per annum; the working expenses (interest on capital and sinking fund excluded), and the consumption of coal per kilowatt-hour produced and supplied. The President drew the attention of the members to the fact that for the Elberfeld station the working expenses (excluding interest on capital and sinking fund) per kilowatt-hour supplied had been reduced to 0·7d., and the coal consumption to 2·65 lbs.

Various Works.—The President now came to the last chapter of his interesting address, and gave a short account of the harbour works of Frankfort, and the results thereby attained. After giving a short sketch of the conditions under which the municipal engineer works in Germany, and the duties which fall to the consulting engineer, the President in a few words directed the attention of the members to the fact that while, at the commencement of the period he had spoken of, municipal engineering on the Continent was generally carried out on ideas derived from England, and while even now, on certain special subjects—for instance, the purification of sewage and the destruction of refuse—England was the source from which ideas were drawn, a very great and independent development had gone on; and he thought it would be of much value for English engineers occupied with municipal works to study and follow up what was being done abroad. Visits such as that which was paid by the Institution to the Continent last summer could, therefore, only be productive of valuable results.

At the close of the address, the President was very heartily applauded; and a vote of thanks was accorded to him, on the motion of Mr. Adam Hunter, seconded by Mr. G. Peyrecave. An interesting incident in this portion of the proceedings was the cordial support given to the vote by Mr. Charles Hawksley, who expressed the pleasure with which he had listened to the address of Mr. Lindley, with whom and with whose father he and his father had for many years been associated. He commended the address to the serious attention of the members, and said that there was sufficient matter in each of the four sections into which it had been divided to form the subject of an evening's debate, if discussion of a presidential address were permitted. He also referred to the valuable diagrams with which the President had illustrated his subject. He strongly supported the suggestion that the members should make themselves acquainted with the Continental languages, and with the works of the engineers speaking them. The President, in acknowledging the vote, expressed his indebtedness to the Secretary of the Institution (Mr. Dunn) and to his colleagues in England for the statistics and other particulars which had enabled him to prepare the diagrams so appreciatively referred to. He said he had sent over a large number of questions to them, and they had been answered with the utmost readiness. He then announced that arrangements had been made for a visit by the Institution to the central station of the South Staffordshire Mond Gas Company at Dudley Port and the Nechells Gas-Works of the Birmingham Corporation.

GAS DEVELOPMENT AT PERTH (W.A.).

Our readers may remember that one of the items in the programme for the last meeting of the Institution of Gas Engineers was a paper by Mr. W. G. Quicke, the Engineer of the Perth (Western Australia) Gas Company, dealing with the above subject; but it did not arrive in time to be taken at the meeting. It has since come to hand, and a print has been forwarded to us by the Secretary of the Institution (Mr. Walter T. Dunn), from which we make the following extracts.

Perth is beautifully situated upon a basin of the Swan River 12 miles inland from Fremantle. The city proper extends some three miles east to west, and covers 2480 acres. It is built almost entirely upon sand of great depth and uniformity, which to the gas engineer proves a redeeming feature in the distribution of his mains. There are about 38,000 inhabitants within the city; and around the boundary a number of suburbs are rapidly growing, in some of which the electric system of lighting has been adopted. The main streets run east and west, and are parallel; the cross streets intersecting, as a rule, at an angle of 90°. But, unlike colonial cities in general, with one or two exceptions, the thoroughfares are narrow—the avenue of trees and wide footways only serving to accentuate in some measure this apparent defect in the original survey. Under the existing arrangements for lighting the city, the mains are continually being added to; and the gas-works, which are about half-a-mile to the south-east of the centre of the city, promise to become no small factor in administering to the requirements of the community.

When the author arrived at the works, early in May, 1901, discipline was at low ebb; and after a few months' effort to establish a more orderly and efficient state of affairs, it became necessary to dispense with some of the oldest hands, and spend some little time in training others. During this period, meters were being returned almost daily, complaints were numerous, both services and dry meters being choked with tar in many instances; and electricians were very active urging the consumers to adopt the "cheaper and cleaner light" at 16s. and 18s. per lamp complete, wired from the meter. The agent in Perth for the Australasian Welsbach Company of Sydney was offering Welsbach burners at 10s. 6d. each, and mantles at 15s. per dozen, chimneys at 12s., and rods at 3s. These high prices naturally retarded the progress of incandescent lighting, and prospects were very indifferent indeed. Prompt measures, however, were taken to check this mischief, and the Gas Company reduced the price of burners to 7s. 6d. each, mantles to 10s. per dozen, and rods to 2s. per dozen. They are now able to sell English burners equal to Welsbach at 4s. 6d. each (Welsbach cost 6s. 6d.); mantles, principally "Veritas," at 7s. per dozen; chimneys at 8s. per dozen; and rods at 1s. per dozen.

One of the incidents which occurred to Mr. Quicke on assuming responsibility was a demand by the stokers for increased pay on Sundays. Their wages were 9s. per shift of eight hours; the leading stokers receiving 4s. per week additional. The agitation ended in a compromise for 2s. 3d. extra. Another trouble arose in connection with the rope-guided gasholder—the largest of three erected at Perth—in a steel tank. Among the first items of repair undertaken was the righting of this apparatus, which was 11 inches out of plumb. The ropes had been continually breaking, and on one occasion a large quantity of gas was lost in consequence. The feature noticeable was a rusting away of the ropes at the water-line; and on examination it was found that the splice had been made without removing the hempen core between wind and water. Oxidation was continually going on; greasing the outer portion being of no avail. Another difficulty was a stoppage of the water supply to the producers and boshes. It was obtained from a 4000-gallon tank erected upon a heavy timber superstructure over the washer, entirely preventing the necessary periodical cleaning out of the apparatus. This tank was served from the town mains at 80 lbs. pressure, and the outlet was completely rusted up, rendering the battery condenser of little use, and destroying the already reduced efficiency of the fires. The engine and exhauster house—a later building some 30 feet above the yard level—is surmounted by water storage tanks in five compartments; two having a capacity of 1200 gallons each for tar and liquor, the other three having a combined capacity of 16,500 gallons of water, with valves and connections for using them collectively or separately. These tanks, which were all in disuse and hitherto unapproachable, were made available by erecting a wall ladder and parapet gangway, whereby the valves could be manipulated, and the tanks cleaned when necessary.

With regard to purification, the lime was not considered finished with until it was black with tar and impurities; the high price (£2 5s. per ton) creating this idea of economy—agriculturists not appreciating the value of lime—and naturally resulting in the production of bad gas for distribution. In discharging and charging No. 2 lime-box, 16 feet square, containing from 3¾ to 4 tons of slaked lime, five men spent two days, the wages totalling £4 8s. 9d. Two weeks afterwards No. 3 box was dealt with, the wages account increasing to £5 5s. 9d., when Mr. Quicke, dissatisfied with the methods employed, personally superintended the work on the next box, and the labour cost was thereby reduced to £2 12s. 6d., and has never risen above £2 17s. since. There was

no testing apparatus in the governor and meter room; so a portable pressure-register was unearthed from the store, overhauled, cleaned, and put up where the man in charge could see it. A sulphur-test apparatus was fixed; and a carbonizing sheet substituted for the slate previously used.

For the second month after Mr. Quicke's arrival, 20 per cent. leakage was shown. By the end of the third month, after repairs had been effected to mains, and numerous small leakages on two holders had been stopped, the loss was reduced to 15 per cent. The four catch-boxes used for oxide purification remained so clean as to create suspicion as to their being in action. Investigation proved the plug centre-valve to be lifted off the face, passing gas freely to the meter There being a strong escape around these boxes, an excavation was made to ascertain the cause, when leaky joints were disclosed. In addition, the purifier, which had originally been laid on the bare sand, had sunk forward on to the connection; repeated wet seasons having washed out the sand, gradually throwing the weight inward, and causing distortion and leakage. To remedy this, brickwork was built under the boxes, having the form of a square well, the corners of which terminated beneath each box, thus releasing the pressure. After overhauling the valve, the set was again put to work. A 15,000 feet rotary exhauster was always giving trouble in running. On examination, the half drum was found to be broken from the shaft. It was sent to a local workshop with a sketch indicating the method of repair, and a steel shaft and collar were fitted, making a creditable job; and the exhauster has since continued to work satisfactorily.

The Gas Company secured the monopoly of both gas and electric lighting. The latter, however (quite a late addition), was the inevitable consequence of a very bad administration of the Gas Department; and it is owing to this fact that the Engineer is unable to fully advertise the better value of gas in a more effective manner. Quite half of the population of Perth are ignorant of the uses of gas, being taught to look upon electricity as the only method of up-to-date lighting; and notwithstanding 7d. per unit, and 5s. per month minimum charge, lighting a six-roomed house costs anything between 20s. and 30s. per month. Consumers grumble and economize; but they pay up, and still decline to try gas—electricians having so well posted them as to "the deleterious effect of gas on health," &c. Unless the consumer approaches the Engineer for suggestions as to a better and cheaper light, there is no other method of reaching him possible than by individual canvassing.

Shortly after Mr. Quicke's appointment, the Company reduced the price of gas for heating, cooking, and power purposes from 6s. 8d. to 5s. 10d. per 1000 cubic feet net; giving a fillip to users of engines, but failing to increase materially the output of gas for cooking purposes, owing in large measure to the high prices of stoves. Recognizing the difficulty of his position, he proceeded to personally canvas the consumers, and soon gained a confidence the results of which have grown beyond the power of one man's supervision. By guaranteeing a given light at a fixed cost, many users of electric current were induced to return to gas, existing fittings being utilized. The possession of the advantages of two sources of light in case of breakdown proved an additional attraction; and, gradually finding the cost of gas was much less, the consumers finally discarded the switch in favour of the bye-pass, and in many cases increased the number of burners beyond the normal.

The proprietors of a number of the principal establishments in the city were induced to abandon the electric light in favour of Lucas incandescent gas-lamps; and full particulars of these installations, and of others in public buildings, are given in the paper. The order for the first lamp from London erected in Perth was given in 1902, and took six months to execute. A consignment was obtained from the Welsbach Company of Sydney, who certainly sent the best lamps, although at an enhanced cost. These, together with a subsequent London consignment, enabled 90 lamps to be fitted up to May, 1903; and during the ensuing year, ending at the same date, 185 were added—making a total of 275 in use. Since that time the number fitted has been increased to 295. Mr. Quicke protests against the extremely high prices of these lamps, and says it would certainly be an advantage to all concerned if they were more reasonable.

In connection with hotels, shops, churches, &c., a system of maintenance has been introduced which, though not producing profit to the Gas Company, is establishing the consumers' confidence in incandescent gas-light. All information concerning these installations is booked, showing the date when last attended to, the time occupied, and the initials of the man overhauling them, thus—

Name.	Installation.	Cleaned.	Cleaned.
Charles Moore and Co.	23 Medways 12 Ivernas 25 Lucas	3½ H and L 24/6/04	3¾ A and L 30/6/04
Globe Hotel	7 Lucas	1. H and O 22/6/04	1½ A and O 30/6/04

The watering of meters is conducted on much the same lines.

The Directors have recently instituted the hiring out of gas-stoves; the rents being arranged on a 10 per cent. basis payable monthly. Consumers so far are slow to avail themselves of this innovation, prejudice against gas being very strong indeed. By careful attention, however, to the individual wants of consumers it is hoped to make this a permanent branch of the Company's business.

In order to show the progress made during the past three years, Mr. Quicke gives the following comparative statement:—

—	Year ended May 31, 1902.	Year ended May 31, 1903.	Year ended May 31, 1904.
Coal carbonized, tons	3232	3151	3322
Gas made, cub. ft.	33,374,900	32,235,000	34,578,000
,, ,, per ton carbonized, cb. ft.	10,322	10,222	10,398
,, sold, cub. ft.	28,176,100	28,422,098	32,095,400
,, ,, per cent. on make, per cent.	84·535	88·222	92·823
,, used on works, cub. ft.	457,300	501,300	558,700
,, ,, per cent. on make, per cent.	1·479	1·543	1·610
,, unaccounted for, cub. ft,	4,664,600	3,318,602	1,923,900
,, ,, per cent. on make, per cent.	13·986	10·234	5·566
Length of mains, 19·5 miles	20·21	21·34	27·227
Number of meters.	590	666	759
,, ,, public lamps, 4 cub. ft.	411	431 { 3 ft. incan.	586
,, ,, Lucas lamps, 3 sizes	..	90	185*
Coke made, tons	1973	1953	1989
,, ,, per ton coal carb., cwt.	12·209	12·375	12
,, sold, tons	1216	1207	1249
,, used on works, tons	752	750	681
Tar made, galls.	38,381	37,784	37,592
,, ,, per ton coal carb., galls.	11·871	11·958	11·32
,, sold, galls.	38,927	26,378½	38,765
Ashes sold (rough), load 1s.	351	270	247
,, (screened) second, bag 1s. 3d.	none picked	400	818
Clinkers sold, screened, load 3s.	33	21	19
Spent lime sold, bag 1s.	none offered	85	502
Cost of coal per ton	29s. 4d.	28s. 4d.	24s. 6d.

* Total in use, 275.

Of the residuals above mentioned, rough ashes are the clinkers, &c., from the producers; and they sell at 1s. per load—the purchaser finding his own labour. Screened ashes denote the coke picked from this clinker; and it is in fair demand, largely owing to the fact of coke being 2s. per bag, or £2 per ton. Screened clinkers—the remainder of the clinkers cleaned of all dust—are used in making concrete on building work. Spent lime has not sold well; but on introducing this residual for sanitary purposes at 1s. per bag, some success was met with during the hot season. At present it is being used to mix with the concrete under the railway siding and the floor of the coal-store.

Coming to the subject of public lighting, Mr. Quicke says the reduction of loss of gas through leakage has had careful attention; and since taking over the public lamps in March, 1903 (the burners of which were then flat-flame, consuming anything between 5 and 10 cubic feet per hour), a considerable increased saving has been effected by fitting Welsbach "C" burners at 3 cubic feet per hour, giving a more uniform distribution of light at reduced cost to the City Council. The lamps run an average 9½ hours per night throughout the year—the hour for extinguishing being fixed at 3 a.m. in all seasons. Owing to the short twilight, the time of lighting varies only between 5 p.m. and 6.30 p.m. Omitting the moon's service, the lighting up averages 22 days per month ($22 \times 9\frac{1}{2} = 209$ hours); so that 725 lamps at 3 feet per hour consume 454,575 cubic feet of gas per month, which at 6s. 3d. per 1000 cubic feet amounts to £142 1s. 1d. Taking the same number of lamps on the old 4 feet per hour basis, the consumption swells to 606,100 cubic feet, which at 6s. 8d. per 1000 feet (the old price), amounts to £202 0s. 8d.—a difference of £59 19s. 7d. per month, or a saving of £719 15s. per annum to the Council. On taking over the lamps, the staff was six men to 411 lamps of the ordinary flat-flame type. At the time of writing the paper there were ten men, including foreman, to deal with 725 incandescent lamps. There is a lamplighters' box to accommodate twelve men and a foreman; also a lantern-shop fitted with all appliances necessary for the repair and construction of lanterns, where the men are employed during the moon's service and during wet weather—each man being taught to carry out his own repairs, in addition to cleaning. For this purpose he works four hours a day; the lighting and extinguishing counting for another four hours—52 hours per week being worked, Sundays included. The men receive 48s. per week; the foreman £3 3s. The latter is a fitter, and supervises all repairs to lamps and services, keeps daily and weekly accounts of work done, and tests all new work and improvements.

The author fully describes the public lighting arrangements in the city. The incandescent burners used are of the "C" pattern, having a given distance from the under-side of the burner to the lantern bottom; thus ensuring that the chimneys shall all be of a given height from the reflector. Details are furnished of the lanterns employed,* and reference is made to a difficulty experienced in connection with the public lighting—viz., the intrusion of insects of large size, which demolish the mantles. In one case, a giant caterpillar 2¾ inches long was found on a mantle rod. Mr. Quicke says the results of the street lighting undoubtedly

* Some of the particulars, with an illustration of Mr. Quicke's improved lantern, were given in an article by him on "Incandescent Lighting in Western Australia," which appeared in the "JOURNAL" for July 21, 1903 (p. 170).

provide the most convincing and unassailable arguments to be used to all classes of citizens, both in regard to the power of the light and economy, in favour of coal gas. The Gas Company and the City Authorities work harmoniously together to effect the utmost economy and efficiency in the distribution of light in the streets; and to this fact, the author says, must be attributed the remarkable progress made during the past twelve months. Lately, an average of 44 new lamps per month have been fitted, covering about 1¼ miles of mains for that number. With regard to maintenance, for the month ended Aug. 31 last, for 725 lamps in operation, the material used was as follows: 318 mantles, 41 rods, 44 chimneys, 46 side glasses, 29 top plates in crowns displacing glasses, 1 bottom glass, and 3 lbs. of putty. The lamplighter also cleaned 100 services, eased and greased 58 cocks, and recoated with whiting 14 reflectors. During the same period two fitters, with carts and assistants, laid services, and erected 24 columns and 24 bracket lamps—a total of 48; also converted 17 column lamps to bracket lamps.

The author gives towards the close of his paper some particulars respecting the works and plant. In the six months ending the 31st of May last, two beds of retorts were completed with regenerative producers in place of ordinary fires. By the construction of these producers throughout, the fuel cost has been reduced to an equivalent of some 50 tons below that of the corresponding six months of last year, when two beds were served by ordinary fires. The retort-house results are now 6½ per cent. better than those of last year. In connection with this department of the works, a much-needed alteration is being effected in the arrangements for delivering and stacking the raw material by the erection of a new coal-store and the extension of the railway siding—the former at a cost of £1302 19s. 1d., and the latter at an outlay of £500. This work is now well in hand. The roof of the store is of flat steel tees and angles, and has a span of 46 ft. 6 in. The building is 136 feet long inside, and is designed for possible extension. Cast-iron columns at intervals of 24 feet are placed along the centre, supporting steel girders of the lattice type, which in turn carry the shoes for both the coal-store and the retort-house roofs on either side. The total weight of the roof and girders, including purlins, is 19 tons 14 cwt., costing £532 erected. The roofing-in and drains, together with the fixing of the gutters, is being executed by the works staff. The siding platforms and coal store floors, together with the alterations to the levels and extensions, points, and crossings, are also being undertaken by the staff, and so far with every promise of success. When the additional coal-store is completed, there will be storage sufficient for a period of six months. Although a carburetted water-gas plant is available, the apparatus does not fill an important part in the economy of the works, owing to the high price obtained for coke; and it is only when an accumulation of this residual occurs (never exceeding 50 tons stock) that the services of the plant are utilized.

In concluding his paper, Mr. Quicke says he fully realizes that the high importance of the city of Perth, as the capital of Western Australia, demands that no effort should be spared to secure for gas the position to which it is justly entitled by reason of its economies and value as an illuminant, as well as for heating purposes, for motive power, and in connection with its bye-products.

Manchester District Institution of Gas Engineers.—As already briefly mentioned in the "JOURNAL," the 140th quarterly meeting of the Institution will be held next Saturday at the Mosley Hotel, Manchester, under the presidency of Mr. H. Townsend, of Wakefield. According to the *agenda* issued by the Hon. Secretary (Mr. H. Kendrick, of Stretford), the chief items of business will be the resumption of the discussion on the paper by Mr. J. G. Newbigging, of Manchester, on "Horizontal *v.* Inclined Retort Installations, with Notes on Coke Conveying," a discussion on Mr. Kendrick's paper, entitled "Notes on Carburetted Water-Gas Workings"—both held over from the February meeting—and a paper by Mr. W. Everitt, of Ilkley, on "Tar Fog." The arrangements made for the visit of the members to the Earl's Court Exhibition on the 9th prox. will be discussed; and the election of office-bearers for 1905 will complete the business.

Electrolysis of Water-Mains in Boston (U.S.A.).—The "Electrical Review" of New York states that in the last report of the Metropolitan Water and Sewerage Board of Boston it is alleged that on 90 linear feet in a 48-inch pipe in Cambridge (U.S.A.) 5225 pittings were observed, varying in depth from 1-16th inch to ⅝-inch. In parts of two lines of 36-inch cast-iron pipe under the Charles River 11 pittings, from 2 to 6 inches in diameter and ⅜ to ¾ inch in depth, were found. The pipes in the river are being destroyed very rapidly. At other river crossings damage was noted. In the city of Chelsea, a 24-inch cast-iron pipe-line in 280 square feet of pipe surface showed 250 pittings from 1-16th to 9-16ths inch deep. In Lynn, on 175 square feet of the surface of a 12-inch pipe were found 387 pittings from 1-32nd to 7-16ths inch in depth, and at another place over an area of 44 square feet were found 200 pittings. The deepest of these was 0·45-inch with only 0·24-inch of the original thickness of the pipe left. A large portion of these pipes will have to be replaced. An insulating joint with a connection made of a rubber gasket 0·5 inch in thickness placed between two flanges has been found helpful in preventing the flow of a large amount of electricity from the Metropolitan pipes to those of the city of Cambridge.

SCOTTISH JUNIOR GAS ASSOCIATION.

Western District.

The business before the Scottish Junior Gas Association (Western District) last Saturday, consisted of a visit to the Kilmarnock Corporation Gas-Works. About seventy members attended, nearly all of whom travelled from the St. Enoch Station, Glasgow, by the half-past two train. Kilmarnock was reached shortly after three o'clock. The old gas-works, situated about two minutes' walk from the railway station, were first visited. There the party were received by the Manager, Mr. W. Fairweather, and the members of the Gas Committee.

Bailie ANDREW ROBERTSON, the Convener, extended to the Association a hearty welcome, and said he hoped they would spend a pleasant and profitable afternoon. They proposed first to conduct them through the old works—part of which was not very ancient, though some portions were pretty old; then they would be taken to the new works, where he supposed they would see something more modern, and, he trusted, something that would be both interesting and instructive. After that, on the invitation of the Electricity Committee, they would visit the electric station, so that those who were interested in electricity would have an opportunity of seeing their new station, which they considered to be quite up to date.

Provost HOOD joined in the welcome, and said he was delighted to meet with gentlemen belonging to the Association.

The party then walked through the works, a description of which was given by Mr. C. Fairweather. Among other things, he called attention to the retort-settings, which are fired on the Siemens regeneration system. They are in eights; and he said they had four ovens of them built about twenty years ago, shortly after they were introduced into the Glasgow works. The exhauster-house was greatly admired for its beautiful machinery and the excellence of its condition. Having driven to the new works, the retort-house there was first visited. The coal breaker and elevator were at work, and these were thoroughly inspected; some of the party going down into the pit to see how the machinery was constructed. The charging-stage was mounted, and here were found eight ovens, back to back, each containing eight 9-feet retorts, fired by an adaptation of the Siemens system. In these works, again, the exhauster-house was the admiration of all; the engines (of local manufacture) working with remarkable steadiness and smoothness. At the close of the inspection, tea was provided in the meter-house.

Provost HOOD said he hoped, now that the visitors had inspected both the old and the new works, they would be satisfied that they had seen something they could take away with them. In Kilmarnock, they had always been proud of their gas-works. They considered that in Mr. Fairweather they had at the head of the works a gentleman whose services they appreciated very much indeed. He devoted himself entirely to his business, with the result that he had as much knowledge about making gas, and as to how gas-works should be laid down, as any man in Scotland. The works in which the visitors now were had been built, as they would see, with the view of having large extensions made to them as necessity required. They had got into the position of having competing works. He was told that in all towns in which electricity was introduced, the consumption of gas did not go down, but had a tendency to go up. He hoped this would be their experience in Kilmarnock. They were all delighted to see so many of the members present.

Mr. J. LOWE, the President of the Association, on behalf of the members, proposed a vote of thanks to the Kilmarnock Corporation and their officials for the manner in which they had been received. He said it had been a very great pleasure indeed to the Association to visit the works. He thought the Corporation had every reason to be proud of their gas-works, and of Mr. Fairweather, their Engineer, and Mr. Charles Fairweather, who had designed them. He was sure the members would take away a great deal of instruction from what they had seen, and they should always have very pleasant memories of their visit to Kilmarnock, and of the way in which they had been entertained.

The vote was heartily accorded.

Bailie ANDREW ROBERTSON, in returning thanks, said he could assure the members of the Association that the Corporation appreciated their visit very highly.

Mr. J. B. WILSON, the Convener of the Electricity Committee, at the request of the Provost, gave a short explanation of the position of the undertaking under their control, which is intended to serve the double purpose of lighting and providing power for the haulage of the tramway cars. The lighting portion is already in use, and the tramway portion is intended to be inaugurated on the 10th prox. He said he hoped that there would be friendly rivalry between the Gas and Electricity Departments, and that the town would get the benefit of both. He remembered, some years ago, when preparing evidence for Parliament, their Auditor told them that the gas-works represented an asset of the value, as a commercial concern, of £100,000. Thirty years ago, the total value of the gas undertaking, when it was bought from the Company, was something like £40,000. This pointed to the fact that during the intervening thirty years the town of Kilmarnock had gone on increasing, and the demand for gas had grown so

that the output was now perhaps four or five times greater than it was then.

The electric station and tramway depôt adjoin the gas-works; and after the visitors had been conducted over these by Mr. A. H. Burbridge, the Electrical Engineer, they were driven to the railway station, in time for the seven o'clock train for Glasgow.

THE ST. LOUIS HIGH-PRESSURE GAS SYSTEM.

Electricity v. Steam for Driving the Blowers.

In the last number of the "JOURNAL" (p. 472), we gave the paper prepared for the annual meeting of the American Gaslight Association by Mr. W. A. Baehr, of St. Louis, on "Electrical Distribution of Power in Gas-Works." The author appended to his paper the following report (dated Sept. 14) made by Mr. Lewis J. Ritschy, the Assistant-Superintendent at Station A of the Laclede Gas Company, where Mr. Baehr's experiments were carried out, showing the steam cost of pumping gas into the St. Louis high-pressure system, against gas pressures of from 1 lb. to 5 lbs. per square inch, both by the present steam method and as it would be if the blowers were electrically driven with current at 1 c. per kilowatt-hour.

Dear Sir,—In conjunction with the tests for your paper regarding the economy of an electrically-operated gas-works, the following figures were obtained: The test for the steam consumption of the No. 9 high-pressure blowers and engines was of 25½ hours' duration. Besides condensing and measuring all the steam of one engine, the speed, the indicated horse power, and the pressures were observed—cards being taken at every change in speed. The second engine was kept running at about one speed, as nearly as possible, so that the amount of gas pumped by each engine was practically the same. This gives the following information from the station-meter readings taken at the beginning and end of the test:—

	Cubic Feet.
Gas pumped per 24 hours	5,550,000
Gas sent out to local low-pressure system . .	2,162,000
Total gas made per 24 hours. . . .	7,712,000

While this result is an estimate to some extent, the slip of the blower being taken as 40 per cent., yet it is safe to say that 2 million cubic feet of gas are sent out daily into the local low-pressure gas-mains at this time of the year.

The steam cost of pumping 1000 cubic feet at various pressures was found to be as follows:—

I.H.P.	Gas Pressure per Square Inch.	Speed. (R.P.M.)	Steam Consumption by Card per I.H.P.	Steam per Revolution.	Steam per Revolution per Pound Gas Pressure.
39	3·4 lbs.	122	30 7 lbs.	0·198 lb.	0·0582 lb.
46	3·7 ,,	132	30·6 ,,	0·216 ,,	0·0584 ,,
53	4·1 ,,	139	31·0 ,, *	0·236 ,,	0·0576 ,,
64	4·7 ,,	141	30·0 ,,	0·281 ,,	0·0598 ,, †

* By test, 37·2 lbs. † Mean value, 0·0584.

The No. 9 blower has a displacement of 22 cubic feet per revolution, and at 40 per cent. slip this becomes 13·2 cubic feet actual capacity. With this assumption and the above data, the following costs were obtained, based on actual boiler-room costs of 78 c. per 1000 lbs. of steam. The steam cost of pumping 1000 cubic feet of gas against various pressures by the present steam engines, and also the cost using electric motors, is as shown below:—

Gas Pressure per Square Inch.	Steam per 1000 Cubic Feet of Gas Pumped.	Cost of Steam per 1000 Cubic Feet of Gas Pumped.	K.W. Hours Electric Power Required.	Electric Cost with Current at 1 c. per K.W.H.
1 lb.	4·42 lbs.	0·124 c.	0·0796	0.08 c.
2 ,,	8·84 ,,	0·248	0·1592	0·16
3 ,,	13·26 ,,	0·372	0·2388	0·24
4 ,,	17·68 ,,	0 496	0·3184	0·32
5 ,,	22·10 ,,	0·621	0·3980	0·40

The kilowatt-hours required are based on the tests and calculations of my previous report—*e.g.*, 50,000 lbs. of steam actually measured for these blowers equal 878 kilowatt-hours, assuming 10 per cent. loss of energy in the blower, and 20 per cent., loss in motor drive, motor, and line loss. That is to say, 70 per cent. of the energy at the switchboard goes into the gas. This assumes the motors driving the blowers by means of a silent chain.

Mr. E. F. Bamber, whose name may be remembered by some of our readers from his contributions to our columns, has sent a copy of a poem he has just published, entitled "An Address to Our Country." The object of the author is to show that England has gradually become more dependent upon outside sources, and that while she has helped to free and advance other nations, she has immolated herself. He appears to look for improvement in the extension of co-operation and mutual aid. Referring to the great inventors whose names are conspicuous in modern history, he points out how "'tis but a century since Murdoch found a gaseous fluid in the solid coal;" and he goes on to show that this wonderful mineral has since revealed to others its "hidden, unexpected gifts," and now "renders gas to light our nights, and heat in many ways to service man."

DETERMINING AND SEPARATING CYANOGEN COMPOUNDS AND THEIR IMPURITIES.

The "Journal für Gasbeleuchtung" a short time ago contained a series of articles by Herr Walther Feld, describing processes based upon the principle of converting the cyanogen compounds into cyanide, distilling off the hydrocyanic acid into caustic soda solution, and titrating with silver nitrate. The following are the principal points brought out by the author.

1. *Alkali Cyanides.*—If cyanides of the alkalis, ammonium, or the alkaline earths are distilled with solutions of certain neutral salts, preferably magnesium chloride or lead nitrate, the cyanogen is expelled quantitatively as (hydrocyanic acid, HCN) thus—

(1) $MgCl_2 + 2KCN + 2H_2O = Mg(OH)_2 + 2KCl + 2HCN.$

(2) $Pb(NO_3)_2 + 2KCN + 2H_2O = Pb(OH)_2 + 2KNO_3 + 2HCN.$

If sulphide is present in the solution to be distilled, lead nitrate should be used, to avoid the evolution of sulphuretted hydrogen which occurs when magnesium chloride is employed. In analyzing a pure alkali cyanide, 0·25 to 0·5 gramme of the substance dissolved in from 80 to 100 c.c. of water, is distilled with from 5 to 30 c.c. of 3 N magnesium chloride solution for 15 to 20 minutes, the exit-tube of the condenser dipping into 25 c.c. of N/1 caustic soda solution. The whole apparatus should be gas-tight, and should be placed in a good draught chamber. To the liquid containing the distillate there is added about 5 c.c. of a 4 per cent. solution of potassium iodide, and the cyanide is then titrated by means of N/10 silver nitrate solution. The results are accurate, and are not influenced by the presence of ferrocyanides, sulphocyanides, or (if lead nitrate be used in the distillation) sulphides.

2. *Iron-Cyanogen Compounds.*—Ferro and ferri cyanides are first boiled in alkaline solution with mercuric chloride, whereby mercuric cyanide is formed, and the latter is then decomposed with sulphuric or hydrochloric acid; the hydrocyanic acid liberated being distilled off and titrated as mentioned for Class 1. The solution of mercuric chloride employed is mixed previously with magnesium chloride in the proportion of one molecule of the former to three or four molecules of the latter. From such a solution no HgO, but merely $Mg(OH)_2$ is precipitated on mixing with the alkaline liquid. The reaction in the case of potassium ferrocyanide is as follows:—

$$2K_4Fe(CN)_6 + 8HgCl_2 + 3Mg(OH)_2 = 6Hg(CN)_2 + Hg_2Cl_2 + Fe_2(OH)_6 + 3MgCl_2 + 8KCl.$$

In analyzing *pure soluble salts*, from 0·3 to 0·5 gramme of the substance is dissolved in from 100 to 150 c.c. of water; 10 c.c. of N caustic soda are put in; and to the boiling solution 15 c.c. of 3 N, magnesium chloride solution are added very slowly to avoid the formation of clots of $Mg(OH)_2$. To the boiling mixture about 100 c.c. of boiling N/10, $HgCl_2$ solution are added, and the whole is boiled for 5 to 15 minutes. The liquid is then distilled with the addition of 30 c.c. of 4 N, HCl or H_2SO_4; the HCN being collected in NaHO, and titrated as above described.

Insoluble pure salts, such as prussian blue, are decomposed by rubbing 0·5 gramme into a cream with from 4 to 5 c.c. of 8 N caustic soda solution, adding 150 c.c. of water, and boiling; 30 c.c. of 3 N, $MgCl_2$ solution are next added, and the process then proceeds as prescribed for the soluble salts.

3 and 4. *Sulphides* (Class 3) and *thiosulphates and thiocyanates* (*sulphocyanides*) (Class 4), and their separation from each other, were given in the "JOURNAL" for Aug. 30 last (pp. 603-4).

5. *Influence of Sulphur, Cyanogen. and Iron Compounds on the Determination of Ferrocyanide.*—In the distillation of ferrocyanides (see Class 2) in presence of sulphides and thiosulphates, the iodine solution becomes slightly turbid, on account of the presence of free sulphur, and can with difficulty be titrated with silver solution. This trouble is overcome by agitating the iodine solution with lead carbonate, filtering, and titrating an aliquot part of the filtrate. In presence of sulphocyanide, the results are much too low if hydrochloric acid is used for the distillation, but the results are accurate when sulphuric acid is employed. Alkali cyanides are without prejudicial effect; by distilling the mixture first with $MgCl_2$ solution alone, the cyanide may be accurately determined, and the ferrocyanide in the residue can then be determined by distillation after conversion into $Hg(CN)_2$.

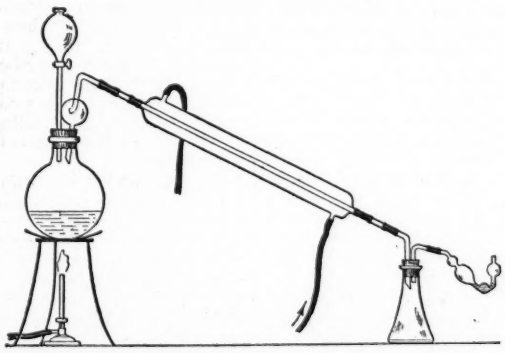
In analyzing insoluble compounds, such as prussian blue, which require to be decomposed first with caustic alkali, serious discrepancies occur if free cyanide, sulphide, thiosulphate, and ferrous compounds are present, as the cyanide, in presence of the alkali, is converted more or less into sulphocyanide and ferrocyanide. In such cases the free cyanide may be eliminated by evaporation to dryness with $MgCl_2$ solution prior to the extraction with caustic alkali; or a preferable plan is to convert it all with certainty into ferrocyanide by treating the substance with a solution of a ferrous salt before extracting with caustic alkali.

6. *Analysis of Crude Cyanide Materials.*—Free alkali cyanide is determined by distillation with solution of $PbNO_3$ as in Class 1. Should any sulphur find its way into the iodine solution, it is removed by means of lead carbonate, as in Class 5. In determining the soluble iron cyanogen compounds, these must not be extracted by boiling or digesting with warm water; even pure cold

water should not be used. By extracting in the cold with a solution of $MgCl_2$, all the soluble cyanogen compounds are obtained without the risk of interaction with the sulphur, &c., present, and the liquid can be readily filtered. It is then boiled with the addition of about 0·5 gramme of magnesia, to decompose free cyanides and sulphides, and, after the gradual addition of caustic soda solution, it is boiled with $HgCl_2$ solution, and distilled with H_2SO_4, as in Class 2. The sulphide is determined by direct distillation with $MgCl_2$, as in Class 3. The residue from the distillation is then divided, and the thiosulphate and sulphocyanide are determined as in Class 4.

In determining the insoluble iron cyanogen compounds (in prussian blue, for example), the method of extraction is of the greatest importance. The author finds that the methods hitherto used are quite unreliable, since on warming prussian blue with caustic alkali solution in presence of sulphur compounds a loss of ferrocyanide occurs, through the formation of sulphocyanide. A short extraction with caustic alkali in the *cold*, however, does not lead to the production of sulphocyanide. The method of procedure depends upon whether the alkali cyanide is first to be eliminated or is to be included in the analysis. In the former case, from 0·5 to 2 grammes of the substance are rubbed down finely with 1 c.c. of 3 N, $MgCl_2$ solution and 2 c.c. of water, and the mixture is dried on the water bath to expel the HCN. The residue, when perfectly cold, is rubbed into a cream with 5 c.c. of 8 N caustic soda solution for a few minutes, about 10 c.c. of the $MgCl_2$ solution are slowly added with continuous stirring, and the liquid is transferred to the distilling flask; 20 c.c. more $MgCl_2$ solution are added, the whole is diluted to 150 to 200 c.c., and is boiled for 5 minutes. To the boiling solution 100 c.c. of boiling N/10, $HgCl_2$ solution are added, and, after 5 to 10 minutes' boiling, the liquid is distilled with the addition of 30 c.c. of 4N, (H_2SO_4); the titration being carried out as before. In determining the total cyanogen content, inclusive of the free cyanide, 0·5 to 2 grammes of the substance are rubbed down finely with 1 c.c. of normal $FeSO_4$ solution and 5 c.c. of 8 N solution of NaHO. The analysis then proceeds exactly as described above.

In a subsequent number of the "Journal für Gasbeleuchtung," the subject of prussian blue in spent oxide, &c., is dealt with by Herr Witzeck. The author confirms Feld's observation that methods for the determination of prussian blue, in which crude cyanide material is first decomposed by heating with a solution of caustic alkali, give results which are too low, on account of the formation of thiocyanate. Feld described processes which are applicable to the examination of such materials, and which the author has largely used, and has found rapid and accurate. The formation of sulphocyanide is entirely avoided. Herr Witzeck uses a simple distillation apparatus, the flask being furnished with a funnel fitted with a stopcock and the main receiver connected to a safety bulb tube. It is shown in the accompanying illustration.



For determining the total cyanogen content, 2 grammes of the sample of spent oxide (or 0·5 gramme in the case of cyanide mud) are rubbed down finely with 1 c.c. of N/1 ferrous sulphate solution and 5 c.c. of 8 N sodium hydroxide solution for five minutes. Then 30 c.c. of 3 N magnesium chloride solution are added slowly, with continuous stirring, and the whole is washed into the distillation flask (which is of 700 c.c. capacity) with enough hot water to bring the volume to about 200 c.c. After five minutes' boiling, 100 c.c. of boiling N/10 mercuric chloride solution are added to the boiling liquid, and the mixture is boiled ten minutes longer. All the cyanogen present is now in the form of mercuric cyanide. The flask is attached to the condenser, 30 c.c. of 4 N sulphuric acid are added, and the liquid is distilled for 20 to 30 minutes; the receiver and bulbs containing 20 c.c. of 2 N caustic soda solution. If the distillate be turbid, owing to the presence of sulphur, about 0·5 gramme of lead carbonate is added, the liquid is agitated, filtered, and an aliquot portion taken for titration. This operation is performed by adding 5 c.c. of 4 N potassium iodide solution and then N/10 silver nitrate solution until a yellowish turbidity appears. 1 c.c. of N/10 silver nitrate solution = 0·009556 gramme of prussian blue $Fe_7(CN)_{18}$. The whole analysis takes about an hour and a half. The following figures show the magnitude of the differences when spent oxide was tested by Feld's method and by the Knublauch-Dreschmidt method. The maximum, minimum, and mean deviations only are given for brevity; but they are sufficient to show the advantage to sellers of spent oxide of an accurate system of analysis.

Average of Two Tests by Method of W. Feld.	Average of Two Tests by the Knublauch Method.	Difference between the Averages.	Increased Return per cent. by Feld's Method.
10·091	9·980	0·111	1·11
9·002	8·430	0·572	6·78
8·928	8·000	0·928	11·60

Herr Feld has likewise investigated Bueb's process of cyanogen extraction, in which the ammonia of the gas is utilized as the alkali required, along with a solution of ferrous sulphate ($FeSO_4$). Instead of all the prussic acid being arrested as insoluble ammonia ferrous ferrocyanide $(NH_4)_2Fe_2(CN)_6$, he finds that the cyanide mud contains only one-fourth of it in that form—one-half existing as soluble ammonium ferrocyanide ($[NH_4]_4Fe[CN]_6$) and the remaining one-fourth as insoluble iron cyanide. According to the amount of oxygen present in the gas, there is a loss of cyanide through formation of sulphocyanide. Hence the process cannot be applied to coke-oven gases. The working up of the cyanide mud is a difficult matter, unsuitable for gas-works practice; and as the recovery of the ammonia is also troublesome, the profit from the process is less than in the case of other wet methods of extraction. Where this process is employed, Herr Feld considers it preferable to work with a weaker (14 to 18 per cent.) solution of ferrous sulphate than that recommended by Bueb, as in this way the absorptive power of the iron salt is fully utilizable, and the cyanogen is retained almost wholly as soluble ammonium ferrocyanide. From such a liquor the ammonia and cyanogen can be readily recovered. Herr Feld has shown that for realizing a high yield the ammonia should previously be removed from the gas as perfectly as possible; otherwise the free sulphur which is always produced from the sulphuretted hydrogen present, acting upon the cyanogen and ammonium compounds, forms sulphocyanide, which is an inconvenient compound, and may represent a loss of cyanogen.

Herr Feld describes in his French patent No. 341,614 (Jan. 18, 1904), his method for obtaining ammonia and cyanogen compounds from coal gas, with partial regeneration of the scrubbing materials. This is a development of the process set out in his English patent of 1902, and given at length in the "Journal" for June 2, 1903 (p. 591). Coal gas is scrubbed with a solution of 280 grammes of ferrous sulphate crystals, and from 1000 to 1300 grammes of calcium chloride for each 100 cubic metres. The solution produced, containing calcium ferrocyanide ($CaFe_2[CN]_6$), and ammonium chloride (NH_4Cl), with a precipitate of calcium carbonate ($CaCO_3$) and calcium sulphate ($CaSO_4$), is treated with lime and steam to obtain ammonia and calcium chloride, suitable for use again. The ammonia gas is obtained free from sulphide, while from the turbid solution the cyanogen radicle may be precipitated as prussian blue ($Fe_7[CN]_{18}$), and the lime mud, separated by filtration after the addition of an iron salt, may be again used in the scrubber. Several formulæ are given, showing the use and proportions of various scrubbing agents, including ferrous hydroxide, or ferrous or manganous sulphate in combination with magnesium or calcium chloride or the like, adapted to be used with gas of certain stated types.

The current issue of the "Annales de Chimie et de Physique" contains a series of lengthy papers by M. Berthelot on certain reactions of cyanogen and its compounds. The extent of the research thus reported precludes anything like a full translation of the papers; but the following *résumé* conveys the chief results of the author's investigations.

In making an attempt to determine the solubility of cyanogen in water, it was found that no final or definite point could be obtained. After treating water with excess of cyanogen for about an hour at 30° C., one volume was found to become apparently saturated after taking up 3·5 volumes of cyanogen—a lower figure than the 4·5 usually given in text-books. On prolonging the treatment, however, the apparent absorption of cyanogen reached 5·2 volumes in 8 hours, 8 volumes in 72 hours, and 9·7 volumes in 96 hours. These results arise from the gradual decomposition of the cyanide by the water. The absorption of cyanogen by alcohol follows a similar course. Chloroform, benzene, and turpentine, on the other hand, dissolve cyanogen pretty nearly according to the normal laws of physical solution. Chloroform was found to take up from 29 to 30 times its volume of gas; benzene, 28 volumes; and turpentine, 9 to 10 volumes.

In examining the action of cyanide of potassium on cyanogen, a weak solution of the cyanide dissolved 9 times its volume of the gas in 24 hours; in nine days, 77 volumes; and on prolonged action, one molecule of potassium cyanide was found to have taken up 47 molecules of the cyanogen without exhausting its absorptive powers. A portion of the carbon is converted into carbon dioxide. A concentrated solution of potassium cyanide (546 grammes per litre) absorbed 121 times its volume in two days, and 156 times its volume in five days. The liquid became converted into a pasty mass; the absorption corresponding to 1·46 molecules of cyanogen for each molecule of potassium cyanide. This product was found to consist of a soluble and an

insoluble portion. The former was free from potassium cyanide, failing to yield prussian blue by the usual reactions. The residue left on evaporation was heavier than the potassium cyanide and cyanogen entering into the reaction, showing that water was absorbed to the extent of at least 3 molecules for every molecule of potassium cyanide. The insoluble matter was found to contain traces only of potassium. Treated with potash in the cold, it yielded a small proportion of a brown acid, which was precipitated again on the addition of hydrochloric acid.

A solution of potassium cyanide of mean strength (93·6 grammes per litre) was found to absorb at once 79 times its volume of cyanogen. In one day it took up 100 volumes, and in 13 days 234 volumes. This last stage represented a ratio of KCN to 14 CN between the two compounds. Carbon dioxide was formed to the extent of one molecule per two molecules of potassium cyanide. Analysis of the solid products, which contained, as before, a soluble and an insoluble portion, showed that they are composed of many molecules of cyanogen in combination with a single molecule of potassium cyanide, and that they are built up in a way very similar to that in which the rhodizonates and croconates are formed from carbon monoxide.

In observing the effect of oxidation on cyanogen compounds, potassium cyanide solution was exposed to oxygen in a sealed tube for several hours, and was found to absorb oxygen slowly. The absorption was much more rapid at 100° C. The action in the cold is intensified by bright light, and diminished by keeping the tube in the dark.

Cyanogen gas (13·8 c.c.) in the presence of water and oxygen removed 3·3 c.c. from 12·8 c.c. of oxygen during exposure to daylight for 26 hours. Gaseous carbon dioxide (3·7 c.c.) was formed, and about 0·9 c.c. of it was found in solution. The water became yellow, but afterwards almost colourless, depositing a brown precipitate. In the dark these changes did not occur to the same extent. On the other hand, the absorption of oxgen in bright light was found to take place with greater activity in the case of potassium cyanide, but no carbon dioxide of ammonia was formed.

MANURIAL VALUE OF SULPHATE OF AMMONIA.

In the pamphlet issued for this year by the Lawes Agricultural Trust, recording the work accomplished and the new departures arranged for, it is stated that large yields of crops were obtained in fields manured with sulphate of ammonia. An interesting illustration of the after-effects of manures is afforded by the experiments on unmanured barley on the potato plots, which had been variously manured for 26 years. Large yields of barley were obtained the first year (1902); and in 1903 the yield, though much less on all the plots than in 1902, was about twice as high on the plots to which ammonium salts or nitrate of soda had been applied for the last time in 1901 as on the continuously unmanured plot, while on the plots which had been furnished with a complete mineral fertilizer as well as with nitrogen, the yield was nearly three times as high.

The institution of new experiments on the cropping and disease-resisting powers of nine varieties of potatoes, and on mangels and swedes, in which the manurial effect of calcium cyanamide will be compared with sulphate of ammonia are also recorded. Calcium cyanamide (CN·NCa) is obtained by passing atmospheric nitrogen over heated calcium carbide, and is an intermediate product in the formation of sodium cyanide. By this means 40 parts of calcium can fix 28 parts of nitrogen; and it has been found that, by heating with water under pressure, all the nitrogen of the crude or of the pure cyanide is converted into ammonia, thus—

$$CN{\cdot}NCa + 3H_2O = CaCO_3 + 2NH_3.$$

It was reported at the International Congress of Applied Chemistry held in Berlin last year, that experiments conducted by Wagner at Darmstadt and by Gerlach at Posen had shown that calcium cyanamide, applied directly to land, has a manurial value at least as high as an equivalent amount of nitrogen in sulphate of ammonia, and not far below that of nitrate of soda. It was hoped that the crude calcium cyanamide containing from 14 to 22 per cent. of nitrogen, and possibly cyanamide itself containing 66 per cent. of nitrogen, would become recognized as valuable artificial manures. At the meeting, it was announced that calcium carbide as a starting-point had been superseded by the action of nitrogen in an electric resistance furnace on a mixture of lime and carbon, and that by a simple lixiviation process the calcium cyanamide could be converted into the crystallizable, easily-purified dicyandiamide, thus—

$$2\,(CN{\cdot}NCa) + 4\,(H{\cdot}OH) = (CN{\cdot}NH_2)_2 + Ca\,(OH)_2.$$

This $(CN{\cdot}NH_2)_2$ fused with sodium carbonate is largely converted into pure sodium cyanide, ready for the market without further treatment, while ammonia escapes as gas to be absorbed by sulphuric acid. The following equation is suggested as an explanation of the reaction :—

$$(CN{\cdot}NH_2)_2 + Na_2CO_3 + 2C. = 2NaCN + NH_3 + H + 3\,CO + N.$$

Mr. Alfred D. Hall, M.A., in a communication to the Chemical Society, has been comparing the effect upon soils of manures such as ammonium sulphate and sodium nitrate. He first explains that the mechanical is quite of equal importance to that of the chemical condition of the soil, and that chemists engaged in the investigation of this subject have agreed upon the term "klay" to represent the particles having a diameter of less than 0·002 mm. These fine particles, which expose relatively the greatest surface to the air, are those which are most active in the growth of plants or cereals; and the author finds that their distribution below the surface of the ground is determined in some degree by the manure employed. The following abbreviated table, giving the percentages of "klay," shows the conclusions arrived at—viz., that sulphate of ammonia preserves the finest particles (the "klay") in the upper layers of the soil, while sodium nitrate tends to carry them to lower levels, thus taking them away from the plane of aërial activity.

Mechanical Analyses of Soils and Subsoils, Broadbalkfield, Rothamsted.

Depth.	Unmanured.		Minerals and Ammonium Salts.		Minerals and Sodium Nitrate.	
	Dried at 100° C.	Ignited.	Dried at 100° C.	Ignited.	Dried at 100° C.	Ignited.
First, 0 to 9 in.	17·3	14·9	17·5	14·9	16·5	13·6
Second, 10 ,, 18 in.	26·6	23·2	29·2	25·7	30·2	26·5
Third, 19 ,, 27 in.	38·8	34·2	38·2	34·3	43·1	38·9

Paul Wagner and his coadjutors have tested the soil and the yield of crops when sulphuretted ammonia and nitrate of soda were employed, and have arrived at the following results: The addition of farmyard manure, both alone and in conjunction with sodium nitrate, to garden soil, resulted in a loss, followed by an increase in the total amount of nitrates. In the soil alone, and in soil to which nitrate of soda alone was added, the amounts of nitrates remained constant during the whole time (64 days). In another experiment, the application of farmyard manure to soil diminished the amount of nitrate present; while when ammonium salts were added in addition to farmyard manure, the reduction in the amount of nitrates was limited to the first 12 days, instead of 96 days, and was followed by a considerable increase till 96 days had passed, after which the nitrates again diminished.

Field experiments showed that the average yield of oats, barley, wheat, rye, potatoes, sugar beet, and mangels was 70 when manured with ammonium salts, as compared with 100 for sodium nitrate. Of the total nitrogen, 43 per cent. was utilized by the crop, when $(NH_4)_2SO_4$ was employed and 62 per cent. with $NaNO_3$. Ammonium salts gave better results than nitrate of soda with barley and oats.

Herr Clausen states that in 1901, with high rainfall in April and May, ammonium salts gave very good results; the yields of winter rye and potatoes being considerably greater than with sodium nitrate. In 1902, with a dry April and a wet May, the latter gave the best results with rye, while with oats they were obtained with ammonium salts.

The friends in the gas industry of Mr. Sidney R. Flavel, and particularly his Brethren in the Evening Star Lodge, will, we are sure, share the regret with which we learnt of the serious accident which occurred to him yesterday week. It appears that he had driven over to Warwick on his motor-car—a small vehicle with a fore-carriage attached—for the purpose of transacting some business in connection with the Warwick Detachment of the 2nd Volunteer Battalion Royal Warwickshire Regiment, in which he holds a lieutenant's commission; and it was on his return journey to Leamington that he met with the accident. The Borough Surveyor (Mr. E. M. Richards) noticed a motor-car lying in the road, overturned, and apparently badly damaged. On drawing nearer and examining it more closely, he found Mr. Flavel beside it in an unconscious condition. Assistance was at once procured, and a medical man sent for. He found that Mr. Flavel had sustained a compound fracture of the left leg and a fracture of the jaw, and his head and face were much cut.

Among the awards at St. Louis Exhibition, we notice a Grand Prize to the Western Gas Association for their exhibit, and to the Gaslight and Coke Company for theirs, of which some particulars were given in the "Journal" for the 25th ult. Gold medals are awarded to the South Metropolitan Gas Company; to Dr. Ludwig Mond, F.R.S., for his gas-producer and ammonia-recovery apparatus; to Messrs. Brunner, Mond, and Co., Limited; and to Messrs. Read Holliday and Sons, Limited. Messrs. Newton, Chambers, and Co., Limited, have obtained a silver medal; and Messrs. F. C. Hills and Co. a bronze medal. Among the awards to collaborators, we notice that Sir James Dewar and Mr. T. Wilton (the Superintendent of the Gaslight and Coke Company's chemical works at Beckton) are recipients of gold medals. For models and plans of public works, Grand Prizes have been awarded to Sir John Aird and Sons, and to Messrs. James Mansergh and Sons. In Group XIX. (Instruments of Precision), the Pulsometer Engineering Company gained a silver medal, Mr. Henry Fleuss, of that Company, a bronze medal, and Mr. Thomas Thorp a gold medal. The New Inverted Gas-Lamp Company have been awarded a gold medal. In Group XX., Mr. A. G. Vernon Harcourt obtained a silver medal.

REGISTER OF PATENTS.

Retort-Benches for the Manufacture of Illuminating Gas.—Derval, E., of Paris. No. 15,860; July 16, 1904. Date claimed under International Convention, Sept. 5, 1903.

The inventor describes "an arrangement of regenerative retort-bench for facilitating the employment of mechanical or other apparatus for removing the hot coke, and of machines for charging and discharging horizontal retorts without closed back-ends." He remarks that the arrangement, which is equally applicable to retort-benches placed back-to-back, furnished with retorts having back-ends, allows of heating retorts of great length with a single gas-generator placed entirely below the retort-setting. It also permits of the suppression of the regenerators placed at each side of the gas generators and of giving to these latter a width of grate proportionate to the number and length of the retorts contained in the bench.

Figs. 1, 2, and 3 show the details of construction of the regenerative apparatus R placed behind the gas-generator G, and separated from the latter by the "smoke collector" C. The feathered arrows indicate the course of the flame; the other arrows that of the gas from the generator G and of the air necessary for its combustion.

Fig. 4 shows a second mode of heating, which may be employed concurrently with that shown by figs. 1, 2, and 3. It consists simply in causing the flames to circulate lengthwise of the retorts, in causing them to change their direction four times, and in reheating them about the middle of their course by the admission of hot air below the partition wall M, which alters nothing of the general arrangement of the furnace retort-bench.

A third mode of heating, analogous to the preceding, would consist

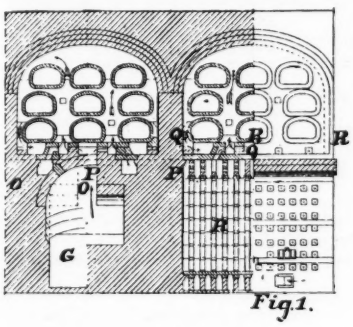
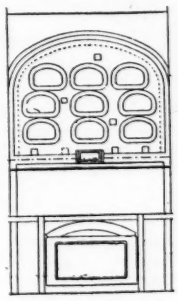


Fig. 1.



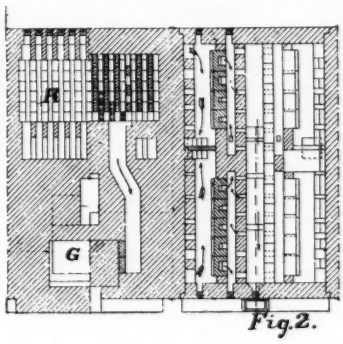
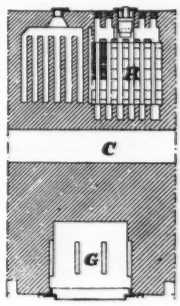


Fig. 2.



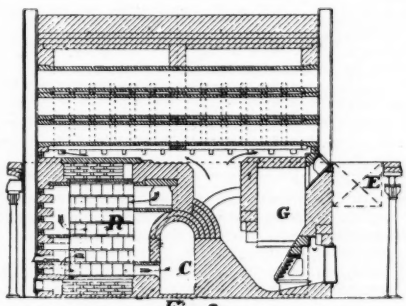


Fig. 3.

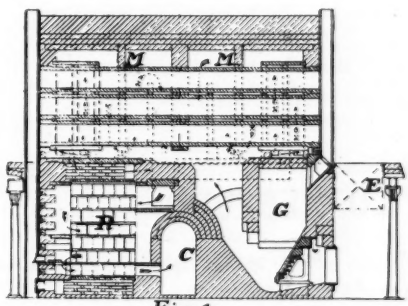
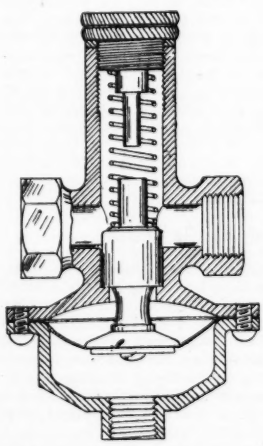


Fig. 4.

in causing the flame to pass into the vertical holes of the regenerator R, as shown in patent No. 7526 of 1899, relating to heating benches of inclined retorts.

The suppression of the projection which the gas-generator generally makes at the front of the retort-benches, when these are provided with double retorts with or without back-ends, allows of the placing at E of the tank of the hot-coke conveyor and causing the hot coke to fall directly from the retorts into the gas-generator when the discharge of the retorts is effected—by means of a windlass ejector, for example.

Automatically Regulating the Supply of Gas to Water-Boilers.—Bond, E., of Old Street, E.C. No. 27,489; Dec. 15, 1903.



The inventor fits a suitable valve-chamber in the gas-supply pipe within which is a valve, preferably (but not necessarily) of the cylindrical plug type, adapted to be moved across the gas-passage so as regulate or shut off the supply of gas. Below the valve-chamber is a larger chamber in which a rubber or other flexible diaphragm is fixed air tight; the interior of the chamber below the diaphragm being in communication with the interior of the boiler. The valve is fixed to the diaphragm; and there is a spring fitted at the opposite end of the valve to regulate the action of the valve according to requirements. The power of the spring may be regulated by a screw plug fitted with a lock-nut; and means are provided for securing a gas-tight joint between this plug and the valve-chamber.

In use, when the water in the boiler is boiling and steam is generated to a certain pressure sufficient to overcome the power of the spring above the valve, the valve more or less closes the supply of gas; and in the event of the valve being completely shut, provision is made to allow sufficient gas to pass to maintain a pilot light or small flames on the burner.

Automatically Lighting and Extinguishing Gas-Lamps.—Westenholz, T. F., of Hellerup, Denmark. No. 17,433; Aug. 10, 1904. Date claimed under International Convention, Aug. 11, 1903.

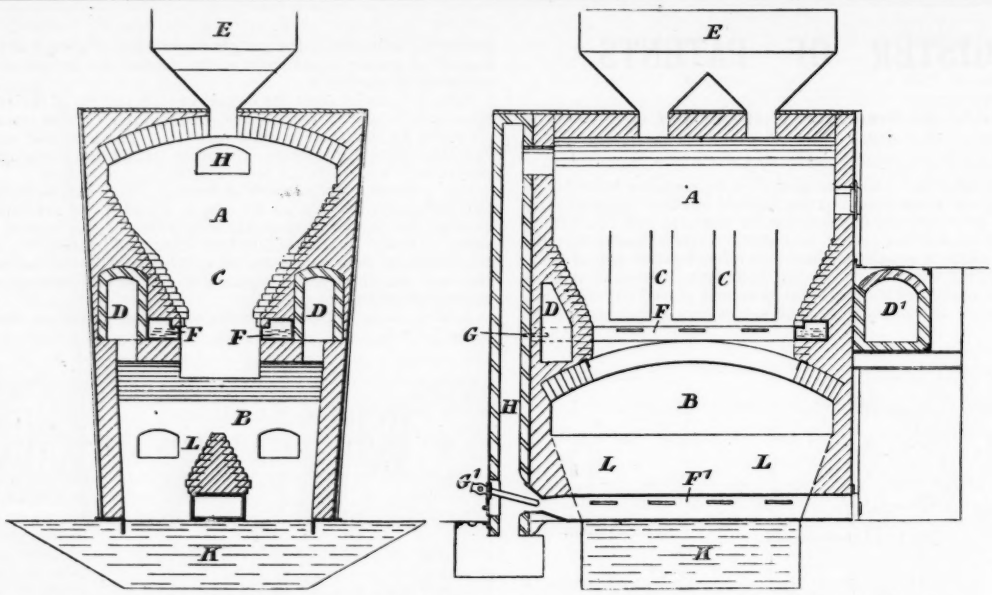
This invention relates to further modifications in the apparatus for the automatic lighting and extinguishing of gas-lamps described in patent No. 17,238 of 1902, and was fully described and illustrated in the "JOURNAL" for June 7, p. 647.

Manufacturing Crude Gas from Coal or other Material.—Heenan, H., of Newton Heath, Manchester. No. 23,616; Oct. 31, 1903.

This gas-producer may (as shown next page) be of rectangular or oval form and divided into two chambers—an upper one A, and a lower one B, with a contracted passage C, connecting the two. The sides, more particularly of the upper chamber, are inclined to direct the fuel towards the centre of the lower chamber and also to provide for a flue D in the brickwork. Above the upper chamber is placed a hopper E, through which the fuel is fed into the upper chamber, where it is first treated. A cast-iron tuyere F, of trough-shape partially filled with water, is placed around the base of the upper chamber, and through it an air blast for the primary combustion is forced by a steam-jet G or otherwise—carrying with it the steam or vapour rising from the water. The upper chamber opens into the top of the lower one, with the contracted passage through which the glowing cinders drop into the lower chamber, "forming a hot glowing mass therein."

A flue or duct H connects the top of the upper chamber with the bottom of the lower one; being connected with it by a second tuyere F^1, of similar construction, with a steam jet or injector G^1, by which the whole of the gaseous products or green gases from the upper chamber, together with a supply of steam and air, are forced into the lower chamber—"sufficient steam being admitted to convert the carbon of the cinders into gas." A trough or pan K containing water is placed below the lower chamber, into which the ashes fall; and a bridge L is built across the chamber to support the mass of hot cinders or coke. Around the top of the lower chamber flues are built, through which the gas passes to the main gas flues D and D^1 and through which they are drawn off to a receiver.

In operation, the fuel is fed through the hoppers E into the upper chamber A, where it is met with a blast of heated air and steam from the tuyere or inlet trough F; and the green gases and products of combustion are carried off through the flue or duct H into the bottom of the lower chamber B, into which they issue from the tuyere or trough F^1 mixed with air and steam. The hot cinders fall from the upper chamber through the passage C into the lower chamber, and the green gases are thereby (says the patentee) raised to a much higher tempera-



ture and their composition changed—the gas passing up through openings into the flues D and thence, through the main flue D^1, to a receiver or container. The ashes fall into the trough or pan K, from which they can be removed without admitting air to the producer.

APPLICATIONS FOR LETTERS PATENT.

24,033.—KESTNER, P., "Washing gases." Nov. 7.
24,047.—WARRY, J., and WIGLEY, P., "Bunsen burners." Nov. 7.
24,064.—ONSLOW, A. W., "Gas-burners." Nov. 7.
24,137.—RENNIE, H., "Gas-valves." Nov. 8.
24,196.—ANDERSON, J., and BENNET, J. H., "Lighting or extinguishing a number of lamps simultaneously." Nov. 8.
24,197.—ANDERSON, J., and BENNET, J. H., "Governing or pressure reducing devices for gas." Nov. 8.
24,237.—LE JEUNE, H., "Gas-engine." Nov. 9.
24,242.—ARZT, A. H., and BARON, S., "Gas manufacture." Nov. 9.
24,248.—WINKLER, A., "Mantles." Nov. 9.
24,292.—WALLACE, C. W., "Generating acetylene." Nov. 10.
24,293.—BRECKON, J. R., "Producing superior coke in connection with gas-works." Nov. 10.
24,308.—REDMAN, T. & R., "Charging inclined retorts." Nov. 10.
24 333.—DESGRAZ, A., "Producer gas." Nov. 10.
24,400.—SUTTON, C. J., and RUDD, J., "Mantles." Nov. 11.
24,422.—KAY, M., "Inverted lamps." Nov. 11.
24,467.—KIRKHAM, HULETT, AND CHANDLER, LTD., and HERSEY, S., "Washing and scrubbing gas." Nov. 11.
24,478.—CLARK, W., "Gas-meters." A communication from E. F. M., E. K. P., F. E., & K. L. Haas, and L. J. E. Weigelt. Nov. 11.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Gas-Mains below Deep Rivers.

SIR,—I want to lay a gas-main in the bed of a narrow, but deep, navigable river, where a suction-pump would be useless to take out condensation; and I would like to consult some engineer who has successfully carried out, or a gas manager who has in his charge, a job of this character.

R. B. ANDERSON.

5, *Westminster Chambers, S.W., Nov.* 18, 1904.

Naphthalene Removal.

SIR,—In your article, and in Mr. Young's contribution which appeared in the last number of the "JOURNAL," the question of royalty was raised. I think managers who are troubled with naphthalene stoppages would not object to pay royalty to anyone who could put them down some reliable plant that would cure the nuisance; but, so far, it seems to have been no cure, no pay, which I think no one can complain about. The methods adopted this year by Mr. Bell and others show that when naphthalene is giving trouble in the services the gas is short of light oil vapours, and that when these are added again in some convenient form, the stoppage soon clears off. Dr. Colman has pointed out that light oil vapours distilling up to 170° C. are valuable preventives of naphthalene; and the more of them the gas contains, the better. From tests I have made for them at the outlet of the condensers, I found in the summer months some 20 c.c. per 100 cubic feet; whereas now I getting 45 to 50 c.c. This shows that it is not necessary to add more oil during the winter months; and I think it also tends to explain why complaints are more numerous in summer than in winter.

H. SIMMONDS.

Bury, Nov. 19, 1904.

Church Lighting.

SIR,—I read with much interest the letter by Mr. George Lane, in your last issue, on "Church Lighting," and I am of the same opinion as that gentlemen—viz., that there is not at present on the market any system of incandescent gas lighting for places of worship and public buildings which is sufficiently decorative and flexible.

I have myself fitted up several churches and public buildings in this district, but have not felt thoroughly satisfied with any of them; neither have I seen any method which could compare with the best systems of electric lighting in decorative effect. What is wanted is something much more attractive and very much more flexible. For instance, owing to the vagaries of our climate, it frequently occurs during Divine service that, at the commencement, the sun will be shining brightly; half way through it will come over very dark; and then before the service is finished the sun will be shining again. Or in public halls it often happens that the performance will commence with vocal or instrumental music, followed by a magic lantern or cinematograph show, succeeded by more music, and so on.

In both of these instances the lights require to be turned full on and then turned completely out while the congregation or audience is in the building. This, of course, can be done very easily with the electric light. What is wanted now is similar flexibility with the incandescent gas-light, together with decorative effect equal to the best systems of electric lighting; and I shall be personally disappointed if the manufacturers of gas appliances do not show us what they can do to solve these problems successfully at the Earl's Court Exhibition, which affords them a unique opportunity.

H. TOWNSEND.

Wakefield, Nov. 19, 1904.

The Removal of Naphthalene Obstructions.

SIR,—As I expected would be the case, no reply is given to the question asked by "Disgusted" in your issue of the 8th inst. It would have been far better if your correspondent had signed his proper name and come out openly. However, allow me to inform him that, in my opinion, he has, if the case can be fully substantiated, an undoubted claim against the gas undertaking for the loss sustained through the naphthalene stoppage. None of the Acts of Parliament very properly make any allowance for occurrences of this description. On the contrary, the rule for a minimum pressure is clearly laid down. A few sharp, crisp fines for damage caused by naphthalene obstruction would be the greatest possible kindness to the gas industry, and would probably also put a stop to the perennial mushroom quack cures and nostrums in relation to it.

A. F. GOODSON.

Clayton West, Nov. 19, 1904.

Incandescent Burner and Mantle Testing.

SIR,—One cannot open the "JOURNAL" without finding something of interest in it and without being stimulated to look a little further than only the "pounds, shillings, and pence" goal. This incandescent gas lighting business presents much that is worth treating with more than a skimming attention. After the perusal of the reports, statements, communications, &c., I always turn to what you have to say on them. Your observations are mostly gratifying reading to me; for the reason, as I expect, that you tackle the subject as a man of a very practical mind would do, and with a view to the application in practice.

There is this question of a standard for the illuminating power of the incandescent mantle. Speaking from experience, I am with you again. Anybody who has to do with incandescent gas lighting must arrive at the conclusion that it is a case of the requirements of each individual installation, and not the demarcated fixed line of so and so many candles to make an installation successful. I take it that out of

2 cubic feet of gas, for instance, mixed with the right proportion of air, you cannot get more light than there is in it.

There are the mantle and the burner combined that are the means of converting the gas and air into light. Anybody who has with the same quality of gas tested different mantles and burners—exchanging the latter and the mantles—has found a change in the light. Supposing, now, another quality of gas enters into the tests as well. Is the difficulty not very great to so time the mantles and burners as to give a standard number of candles of light? Is this required in the everyday application of incandescent gas lighting? Of course not.

Soon after I went into this business and met the problems, I reflected, What is it all about? I think the answer is as stated above—produce the nearest possible condition to the natural light. What gives the most satisfaction to us, after being for so many hours in the sun's light and the latter is gone, is a diffusive light—not a stinging one with its contracted area of the zone of light, but a generous light that fills all corners. This is the light I set up for a standard.

Nov. 9, 1904. C. J. ALEXANDER.

LEGAL INTELLIGENCE.

The Heathfield Natural Gas Company.

In the Chancery Division of the High Court of Justice, Mr. Winney applied *ex parte* to Mr. Justice Warrington, last Tuesday, on behalf of the plaintiff in the action of *Watts v. Natural Gas-Fields of England, Limited*, for the appointment of a Receiver and Manager of the Company's property. The plaintiff is a debenture-holder for £1000. Counsel said the Company was formed to work a stratum of natural-gas bearing land in Sussex; and a considerable part of Heathfield, including the village and railway station, was lighted by the Company. The evidence showed that unless funds could be raised to keep the concern going, considerable public inconvenience would be caused. The plaintiff's debentures were only issued a short time ago, and were not yet due; but he moved on the ground of jeopardy of the security, as several judgment creditors were threatening execution, and there was a suggestion of winding up the Company voluntarily. His Lordship granted the application.

Action in Regard to Sulphate Plant.

At the last Manchester Assizes, Mr. Justice Walton and a Special Jury were occupied for three days in hearing an action brought by Messrs. Neill against the Burnden Tar Company, Limited, to recover £469 12s., the value of a sulphate of ammonia plant supplied by them to the defendants. The latter alleged that the plant was ineffective; and they counter-claimed for loss arising from delay in delivery and other causes. Mr. Horridge, K.C., and Mr. Acton appeared for the plaintiffs; Mr. Sutton and Mr. Gordon Hewart represented the defendants. Among the witnesses called for the plaintiffs was Mr. G. E. Davis, the patentee of the type of plant supplied by the plaintiffs. He said that on the 18th of January and again on the 24th of March, he inspected the plant on defendants' premises. It produced unsatisfactory results, not because of any structural defect, but on account of faulty manipulation. Too much lime was being used in proportion to the ammoniacal liquor, with the result that the pipes became clogged. At most works of this description, a qualified chemist was employed to superintend the process; but the defendants employed two ordinary sulphate makers only. Mr. A. Davis, brother of the preceding witness, said he saw the plant at work, and found nothing wrong about it. At the time of his inspection, under proper management, it turned out sulphate equal to 2 tons in 24 hours. Mr. Isaac Carr also said he had examined the plant, and found that it worked well so long as the proportion of ammoniacal liquor and lime was properly regulated. At the close of the plaintiffs' case, Mr. Sutton addressed the Jury for the defendants. He said that their case was that the plant was defective to start with, ineffective for producing the results guaranteed, and a source of loss. If the plaintiffs had failed to carry out their contract, they must consequently pay damages. Mr. Herbert Porter, an Inspector under the Alkali Acts, stated that he had examined the plant on several occasions, and had found the construction such as made its registration impossible; and it had not yet been officially passed. The defendants, however, were so pressed as to what to do with their liquor, that after one purifier had been constructed the Chief Inspector (as the works could not produce the full quantity of 15 tons per week) gave them permission to start. A second purifier was still needed. Mr. Newbigging described tests he had made to prove the capacity of the plant. He said that the utmost it could produce was 30 cwt. per day of moist, or 25 cwt. of dry merchantable sulphate. He considered that the plaintiffs were rash in putting its productive capacity at 2 tons, using ordinary standard gas liquor. Mr. R. Hooton, the Manager of the Ashton-under-Lyne Gas Company, also gave evidence for the defendants. Mr. Hutchinson, their Managing-Director, said the plant was a complete failure; and its working was attended with constant difficulty and loss. Three workmen in the service of the defendants who had charge of the plant were examined as to its alleged inefficiency. They said constant difficulties arose from back-pressure and the clogging of the pipes, and not more than 12 or 14 cwt. of sulphate per day could be produced, as a rule. Its utmost capacity was stated by one of the witnesses to be 1 ton per day. A considerable body of technical evidence was given with regard to the structure of the still, as well as to the suitability of the plant generally for the work intended. Counsel for the respective parties having addressed his Lordship, he summed up. He said the Jury had to determine first what the contract was, and the circumstances under which it was entered into; then whether it had been broken; and, if so, what damages had been sustained. The Jury found for the plaintiffs on the claim for £333, and for the defendants on the counter-claim—damages £150.

MISCELLANEOUS NEWS.

PROJECTED GAS LEGISLATION FOR THE METROPOLIS.

Last Friday morning, the first indication was given of the scope of the projects to be brought before Parliament next session in connection with the gas supply of the Metropolis. The following are the chief features of the Parliamentary Notices which appeared that day.

Gaslight and Coke, South Metropolitan, and Commercial Gas Bills.

What may be regarded as the most important piece of projected gas legislation is contained in the notice of a Bill to be introduced by the Gaslight and Coke, South Metropolitan, and Commercial Gas Companies to repeal, alter, or amend the statutory provisions now applicable to the three Companies with respect to the method of testing and determining the illuminating power and the quality or purity of the gas supplied by them, and to prescribe the nature of the burner and apparatus to be used for the purpose of testing that power, and the manner in which they are to be used. It is proposed to repeal any statutory provisions in force affecting the three Companies with regard to the removal of sulphur compounds (other than sulphuretted hydrogen) from gas supplied by them; and to repeal or modify any statutory provisions which require the gas to be wholly free from sulphuretted hydrogen, and to make provision with respect to the limitation of the amount of it in gas supplied and with respect to the method of testing therefor. Application will be made for the amendment of the existing statutory provisions in relation to the Companies as regards forfeitures in cases of deficiency in the illuminating power or quality of their gas or the pressure at which it is supplied; and it is proposed to make new provisions with respect to the determination and recovery of such forfeitures and the procedure in respect thereof. The Bill will enlarge the powers of the Chief Gas Examiner, and provide for the hearing by him of applications made for the recovery of forfeitures in respect of illuminating power, purity, or pressure. It will also provide for the determination by him of the amount of the forfeitures (if any) to be paid by the Company in default in all cases, with such exceptions as may be defined. In the event of any difference between the Companies, or any of them, and the Gas Referees as to the reasonableness of any requirements of the latter, or as to compliance therewith, the decision of the Chief Gas Examiner is to be conclusive. It is intended to make new provisions with respect to the times for testing the gas, to discontinue testing on Sundays, and to remove any obligation to test daily on other days of the week—leaving it optional with the testing authorities to test on any day other than Sunday. Provision will be made that in cases where any defect is found or alleged to exist in the illuminating power, quality, or pressure of gas, notice is to be given by the testing authority to the Company concerned. The Bill will limit and define the period for giving such notices, and provide as to the effect thereof.

South Metropolitan Gas Bill.

The South Metropolitan Gas Company intend to promote a Bill to alter the statutory provisions in force with regard to the Gas Referees, and amend (so far as may be necessary for the purpose) the Company's Acts of 1869 and 1876, the City of London and Gaslight and Coke Companies' Acts of 1868, and the latter Company's Act of 1876, the Commercial Gas Company's Act of 1875, the Gaslight and Coke and other Gas Companies' Acts Amendment Act, 1880, and any other Act relating to the three existing Companies' undertakings, and to the duties, powers, and privileges of the Referees in relation thereto. Provision will be made for compensating the Referees out of the funds of the Company in respect of any loss of emoluments sustained by them in consequence of the proposed change, and also for contributions by the Gaslight and Coke and Commercial Companies towards such compensation, if the Companies, or either of them, should so think fit. It is proposed to make applicable to the three Companies the provisions, or some of them, with respect to the above-mentioned matters, of the Gas-Works Clauses Act, 1871, with such modifications as may be defined in the Bill. The Company will also apply for an extension of the exemption from liability to distress conferred by section 159 of the Act 5 Vict. (Session II.), cap. 79, so as to include gas engines, apparatus, and appliances let by the Company on hire to consumers; and provision will be made in the Bill that "engines, fittings, apparatus, and appliances let by the Company on hire to consumers, although fixed or fastened to any part of any premises in which they may be situate, or to the soil under any such premises, shall not by reason thereof cease to be the property of, and removable by, the Company, and shall not become the property of, or liable to be disposed of by, the owner of such premises or soil, or by any mortgagee who may enter into possession under or foreclose any mortgage or charge." The Bill will also contain provisions with respect to erroneous registration by defective meters, and the charges for gas in such cases. The Company will likewise seek authority to acquire, compulsorily or by agreement certain premises in Alexander Street, Old Kent Road, for the purposes of their undertaking. The Bill will incorporate, with or without modification, the provisions, or some of them, of the Lands Clauses Acts; and it is proposed to exempt the Company from any obligation to offer, under sections 128 to 132 inclusive of the Lands Clauses Consolidation Act, 1845, any lands at any time intended to be sold by them.

South Suburban Gas Bill.

The South Suburban Gas Company intend to apply for an alteration of the provisions of the Crystal Palace District Gas Act, 1873, and the Crystal Palace District Gas Act, 1893, with respect to the quality and illuminating power of the gas to be supplied by the Company; relief from the Company's existing obligations with respect to the removal of sulphur compounds other than sulphuretted hydrogen; and the repeal of the provisions of the above-named Acts with respect to the removal

of such compounds. Provision will be made for the free supply, to consumers who may require them, of flat-flame burners most suitable for the proper consumption of gas of the illuminating power proposed to be supplied; and also with regard to the method of testing the illuminating power and purity of the gas. The Company will seek to exempt from liability to distress, and from being taken in execution or in bankruptcy proceedings, any engines, motors, dynamos, meters, stoves, ranges, pipes, fittings, apparatus, or appliances in, or in connection with which gas may be used, which may be let by the Company for hire to any consumer; and the Bill will contain a clause similar to the one already quoted in connection with the notice for the South Metropolitan Gas Company's Bill, in regard to the retention of the possession of engines, &c., let on hire, and fixed upon consumers' premises. Provision will be made with respect to the erroneous registration by defective meters and the charges for gas in such cases, as well as for the use of anti-fluctuators or similar apparatus in connection with gas-engines; and the Company will seek to be enabled to refuse to supply, or continue to supply, gas to any engines not fitted with these or such similar apparatus as they may prescribe.

THE EXPLOSION AT THE SALTLEY GAS-WORKS.

Close of the Inquest—Verdict of "Accidental Death."

At the Victoria Courts, Birmingham, on Monday last week, Mr. ISAAC BRADLEY, the City Coroner, concluded the inquiry into the circumstances attending the explosion at the Saltley Gas-Works on the 10th ult., by which three lives were lost. The previous proceedings were reported in the "JOURNAL" for the 18th ult. (p. 189).

The first witnesses called were two men named Newton and Williams, the only survivors of the party of five who were in the purifying-house when the explosion occurred. They had been discharged from the hospital, but were still suffering from the effects of injuries.

Thomas Newton said he was engaged at No. 2 engine-house when he heard a lute blowing in the purifying house. He warned Jordan, the valveman, who afterwards took a lighted safety lamp from the meter-house and went with witness and three other men to the spot where the leakage was. Jordan directed to be brought into use the appliance for shutting off the box that was blowing. He told Elkington to turn down the valve a screw; but this was not effectual. They then put the key to the centre-valve, and four of them turned the table round while Jordan watched the pointer. After he had given the order to stop, he said: "Turn back a bit; I have forgotten the pointer." They obeyed, and then Jordan ran the disc valve down. Despite this, Jordan said the gas had not shut off; and he walked away, the others following. Before they had gone many yards the explosion occurred. The only light in the purifying-house was the safety-lamp. Nobody was smoking.

Francis Williams, another engine-man, said that when Jordan found the valve was not shut, he asked Elkington which way he had turned it. Witness did not know what the answer was; but before leaving Jordan turned the valve back again.

Mr. *T. R. Murray*, the Resident Engineer at the works, said written instructions were given to the valvemen as to what they should do in various contingencies, including the blowing of a purifier. In the latter case the valveman was to "immediately tell the engine driver to reduce the speed of the exhausters, so as to work at level gauge, then send for the superintendent, open the lime bye-pass, and shut the inlet and outlet valves on the box that was blowing. There were also instructions as to precautions to be taken to prevent a blow. They were: "Should the back-pressure on either section exceed 22 inches, reduce the same at once to 20 inches by opening another inlet or outlet to a lime purifier." After the explosion, the centre-valve pointer was found to be 9 inches away from the indicating notch to which it should have been brought for dealing with the box that was blowing. Witness produced the safety lamp in use at the works, and explained the tests to which it was regularly subjected, so as to determine its efficiency. The tests were more severe than those laid down by the manufacturers as adequate.

Mr. *R. A. S. Redmayne*, who was called to give expert evidence as to the safety lamp, said he was Professor of Mining in the University of Birmingham. He was well acquainted with the action of safety lamps, having had twenty years' experience of collieries. Immediately before his appointment to Birmingham University he was Resident Manager of the Seaton Delaval Collieries, Northumberland. Pure gas would not explode at all without admixture with air; but some gases, in themselves non-explosive, when mixed with a certain proportion of air were rendered explosive—that was to say, very highly combustible. The lower explosive limit was reached when a mixture contained anything from (say) 6 to 9 per cent. of illuminating gas. It continued to get increasingly explosive till it reached a certain point, at which the explosiveness began to diminish. The point at which it had already begun to lose its explosive power, and immediately after which it became non-explosive, was at from 22 to 29 per cent. of gas. If a light were placed in the lower explosive atmosphere, the gas would kindle only in the immediate neighbourhood of the flame—it would not extend. At and above the higher limit, the gas would burn until it had exhausted the supply of air that kept combustion going, but would not extend. It would burn on the fringe in the neighbourhood of the air, but would not extend inwardly. The theory of the safety lamp was based upon the fact that the mesh of gauze encircling the flame—separating the flame (say) from an explosive mixture of gas—would, owing to its cooling property, prevent any flame passing from inside the lamp out to the explosive mixture. The original Davy lamp was safe in explosive mixtures under the following conditions: (1) So long as the gauze was not red hot; (2) provided the explosive mixture was in a quiescent state, or, in other words, so long as it was not being played upon by a certain draught; and (3) provided that the lamp itself was in a quiescent state—that was to say, if there was no shock or sudden passage of the lamp through the explosive mixture. If these conditions were not complied with, the flame would pass through the gauze. An unshielded Davy lamp was unsafe if it was moved at the rate of 6 feet per second in an explosive mixture. It had been fired at as low a velocity as 4 feet per second, but not lower than this. Consequently, the patterns of lamps had been much shielded and protected in all sorts of ways. A protected lamp of (say) the Marsaut type would withstand a current of 30 feet per second. [Witness produced a lamp of the type named.] In a mine, no lamp was allowed to be in any other than a perpendicular position. The bulk of a lamp had an effect on its safety or danger. In case of sudden shock, there might be a mild explosion, which would be quite safe in a Davy lamp, or in one of the Marsaut size. But the larger the lamp, the larger the internal explosion would be; and it might pass the flame through the gauze to an external explosive mixture. It was for this reason that safety lamps for mines were limited to 1½ inches diameter. Every safety lamp consisted of two parts, the gauze and the remainder—glass, oil-can, and so forth. There should be a certain relation as between the gauze area. The lamp in use at the Saltley Gas-Works was an admirable one for giving light; and he should say it would be safe under normal conditions—in the lower and the higher limits he had quoted. He would go so far as to say that even in an explosive mixture it would be a safe lamp for a certain time, provided it was in proper condition.

The CORONER: Oh, yes; we assume that, because there is every evidence to show that this lamp was. So that, under the normal conditions of the purifying-house, it would probably do its duty.

Witness: Just so.

Invited by the CORONER to offer any criticisms he had to make against the construction of the lamp, witness said in the first place it was too large in its internal space; secondly, the gauze area was small in proportion to the lower portion of the lamp (the tin and glass area); thirdly, the fact of its having only a single gauze was a weak point in its construction, and he thought that the oil-flame was too large. In this connection he would remark that there were no external means of lowering it that he could see. A miner's lamp could be lowered without opening it; but it was not so in the case of the lamp in use at Saltley. He also thought that the manner in which the windows of the lamp were constructed was a source of weakness. The joints were not anything like so strong as in a miner's lamp; but it should be said that the latter was subjected to very much more knocking about than the other. Still a small shock might render the Saltley lamp very unsafe by loosening the glass and tin.

The CORONER: You have seen the tests suggested by the manufacturers. Should you agree with Mr. Murray when he said that these tests had been more than complied with by the Gas Department.

Witness: Yes, I witnessed the tests the Department conducted; and they certainly more than comply with the instructions received from the manufacturers of the lamps.

Should you regard the tests as carried out from day to day as sufficient or not?—No; they are are not sufficient.

Will you suggest in what particular?—They are not sufficient inasmuch as they do not reproduce the conditions that this lamp may have to withstand in actual practice. I say "may have to withstand" advisedly. They do not reproduce the conditions that this lamp would be subjected to in the circumstances that existed, as I understand, prior to the explosion. That is to say, the case is put over the lamp, and a current of gas is passed into the cylinder. It is not an explosive mixture that is being passed in, but a flow of pure gas. There is a flow of explosive mixture for a very short time in the cylinder, inasmuch as the gas is mixing with the air that is already in it. That this is so is evidenced by the fact that one notices a flickering or reeling of the flame within the lamp; but it is only for a very short time. The flow of gas continues, and a point is reached at which the gas is so great in proportion to the air, and also the products of combustion, that they put the light out in a very short time. There is no time for the gauze to become sufficiently hot to allow of the passage of flame.

A number of hypothetical questions were then put by the CORONER in relation to the explosion at Saltley. In answer thereto, witness said if the safety lamp used by Jordan had been burning all night, as was said—burning, too, with a flame of the size stated—the gauze would be warm, not to say hot, though, in all probability, not sufficiently hot to be dangerous. Then if it were carried into a mixture of gas and air—even though it were not an explosive mixture—the temperature would go up very considerably, and the gauze would become still hotter.

The CORONER: If it were then carried into an atmosphere charged with gas—I will say, simply?

Witness: The flame begins to elongate in the mixture even before it reaches the explosive point.

Is it from the elongation of the flame that you apprehend the heat, or from the mere presence outside of the gassy air?—No; it is from the fact that the flame is elongated. There would be more heat coming from the lamp itself.

If it had been standing for (say) a quarter of an hour in an explosive or partially explosive atmosphere, and was then carried along in the hand, should you regard it as being dangerous?—It might then be in a very highly dangerous state, because the gauze might be either red hot or something approaching red heat.

We see that the retort-house end of the building was blown out, the other end being left standing; and we are told that the wind was in that direction—that the men were walking the way of the wind. Is there anything that suggests itself to your mind in that?—Well, the whole thing is remarkably like what would be witnessed in a colliery explosion. I have examined the house, and have noticed that the direction of the wind is the same apparently as the direction of explosive force. Now, it occurs to me that this gas, issuing for some considerable time, would be banked up, in the house, and would be blown in the direction in which there is the greatest force shown—the direction, in fact, in which the men were walking. So it is quite possible that, walking in that direction with a lamp in a dangerous state, they would be walking into a highly explosive mixture.

Then if we accept these conditions, I want you to tell me, as far as

you can, in what different ways, without any blow or breakage (the lamp does not appear to have been broken prior to the explosion), the lamp might fire.—There are several conditions under which it might fire. First of all, if the gauze had become red hot. Secondly, if it had become very hot, but not red hot, and the men were swinging the lamp, the passage of the flame is rendered more easy by the combination of these two circumstances. Or if the lamp, being hot, were dropped as the men were passing into this explosive mixture. Or if, having been standing for some time in a mixture which, though perhaps not explosive, contained gas, so that the lamp became heated, it were brought into a mixture that was highly explosive, an internal explosion occurring within the lamp might pass through it. Or, under the same conditions, but supposing there to be an eddy or side current of wind which might impinge on the lamp, thereby causing a current in excess of the point of safety, again the flame might be passed through the gauze.

Then I think the last question I want to put to you is: What suggestion would you offer as to the lamp for the future?—I would suggest either one of two. A lamp of the Marsant type, if an oil-lamp was desired, which would be—though no miner's lamp is absolutely safe under all conditions—as safe as any type of so-called safety lamp. That is the sort of lamp one would utilize in a fiery mine. But the conditions are different; and I would suggest using a hand electric lamp of the Sussmann type.

Replying to a JUROR, witness said a cover which was placed over the gauze of the lamp used by Jordan might, in some instances, increase the temperature.

Another JUROR: Is it not possible to suggest fixed electric lights in the purifying-house?

The CORONER: I think we will leave that to the Gas Committee, because the accident has not arisen out of that at all. The fixed lamps were not alight; and they appear to me to be secure. They are properly sealed, and have an external inlet and outlet. The air comes in from the outside; and all the products of combustion go again to the outside.

Mr. S. H. KNYVETT (His Majesty's Inspector of Factories for the district): I should like to ask a question on one point that has not yet been touched, and that is as to the construction of the house. Do you not think, if the purifying-house were built with more means of escape, if there were less masonry, there would be less chance of the explosive mixture being bottled up?

Witness said he was not a gas engineer; but he might say that, of course, a confined gas was more dangerous to enter into than one that was unconfined. In the case of a light steel building, gas would not collect at all.

Mr. *Henry Hack*, Engineer-in-Chief to the Gas Department, stated, in reply to the CORONER, that their new purifying-house at Devon Street was built without outside walls. It stood to reason that the less brickwork they had, the more chance the gas had of getting away.

Professor *Redmayne*, replying to Mr. KNYVETT, said his objection to the lamp tests applied both to the ordinary test and to the test of the cylinder. He did not think that spraying round with a tube was any test at all.

The CORONER, in summing up, traced the sequence of events, and the relation of the hypothetical evidence. He thought there were many circumstances to show that Jordan got alarmed. The easiest way of dealing with the blow would have been to bye-pass the gas over the whole series of purifiers, which he could have done himself. But he did a much more laborious thing, for which he needed help; and he told Elkington to turn down the paddle, which was the second thing to do, instead of first getting the valve opposite the box. The Jury might or might not be satisfied that the lamp caused the ignition of the gas; but he did not see that this need necessarily form a part of their verdict.

The Jury returned a verdict of "Accidental death," without adding any recommendation or comment.

HESSLE DISTRICT COUNCIL AND THE GAS-WORKS.

A Purchase Bill to be Promoted.

A Special Meeting of the Hessle Urban District Council was recently held to further consider the question of the compulsory purchase of the Gas Company's works, and some other matters, which the Council propose to incorporate in a Bill for next session. Mr. T. Appleton, J.P., presided. The Chairman stated that various reports, more or less inaccurate, had gained currency in connection with the Bill proposed to be promoted. During the late Chairman's term of office, the Council seriouslp considered the advisability of buying the undertaking of the Gas Company, but no definite steps were taken. Some months ago, the Company sought power to alter their Memorandum of Association, so as to enable them to become wharfingers, and enter into other kinds of business transactions, which were evidently not provided for when they first started. This brought up again the question of whether the Council should become the purchasers of the undertaking. He had had statistics from nearly every urban authority that had taken over the local gas concern, with the cost, and the results of the working under public management. In addition, they had had the guidance of experts in gas matters, and also of their Parliamentary Agents; and they had come to the conclusion that, in the interests of Hessle, it was advisable to promote the Bill at once, especially as the Company were applying for statutory powers. Of course, it was known that the Council's efforts to arrange a price mutually with the Company had been futile. He had no doubt that the action of the Council would be upheld at the ratepayers' meeting, which would be held in due course. At a little more expense, they were including in the Bill other powers affecting the well-being of the town. Several resolutions were then submitted, one of which was—"That the Council apply in the next session of Parliament for an Act to transfer to the Council the undertaking of the Hessle Gaslight and Coke Company, Limited, and to empower the Council to supply gas." They were all adopted with one dissentient.

ORIENTAL GAS COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held last Wednesday, at the London Offices, Finsbury House, Blomfield Street—Mr. R. HESKETH JONES in the chair.

The SECRETARY (Mr. H. J. Luff) having read the notice convening the meeting, the report of the Directors and the accounts for the year were taken as read,

The CHAIRMAN, in moving their adoption, said when the proprietors met last November, he told them of the changes the Board had made in the Company's staff at Calcutta, and mentioned that, with four Englishmen in their service, the Directors looked forward to increased business, and to still more satisfactory results than had been attained in the past. He also then stated that he hoped—if spared to have the pleasure of meeting the proprietors again this year—to have the gratification of telling them what improvements had been effected under the new management. It was very gratifying, therefore, to be in a position to lay before them such a satisfactory report and statement of accounts as those which had been circulated among them. Nothing had been added to the capital outlay account. The Board had, however, reduced the suspense account for the outlay incurred in improving the public lighting service; and they hoped that, during the next two years, this item would disappear from the balance-sheet. The reserve fund had been increased, and was now equal to one-sixth of the paid-up capital. It was fully invested, and realizable for the £50,000, as they had written down the investments to Stock Exchange values. The depreciation fund now stood at £50,000, which practically reduced the expenditure on capital account to £291,876. On the debit side of the balance-sheet, there was an item of £2500, called a suspense account. Therewith, the Board proposed to create an insurance fund, to meet extraordinary expenses, such as damage by explosion, storm, or tempest. The insurance fund they hoped would also be a *bonâ fide* one—that was to say, that it might be represented by marketable securities. There was a new item in the revenue account, for superannuations. The Directors, on the retirement of Mr. Niven, in June of last year, granted him, in recognition of his 21 years' service, his full salary, for the then ensuing three years. This item, so far as Mr. Niven was concerned, would disappear after June 30, 1906. It would also be noticed that £2000 more was being carried forward to next year's undivided profits than was brought forward from 1903, and that the payment of an 8 per cent. dividend for the year was recommended—being the same rate of dividend that had been paid for some years past. He ventured to think that the proprietors would consider all this very satisfactory. Now as to the management and progress of the business. The Directors' report informed the proprietors that the gas-rental had advanced by 6¼ per cent. over the preceding twelve months. The working details had not been quite so good, owing to the fact that there was a large accumulation of old stocks of coal and coke when Mr. Niven left; while the mains and distributing pipes, as well as some portions of the gas-works, were in an unsatisfactory condition. Their present Manager (Mr. James Watson) had, therefore, been very much handicapped; and so he had been unable to show such good results in the make or the sale of gas per ton of coal carbonized as he had hoped. These unfavourable circumstances had been entirely beyond his control; but he had done his level-best to overcome them. During the past year, 599 additional public lamps had been erected; and further orders were in hand. One of the principal thoroughfares in Calcutta (the only one hitherto lighted by electricity) would shortly be lighted by gas. Three miles of mains had been taken up and renewed; and 13 miles of additional mains laid, while no less than 930 service-pipes had been renewed for public and private lighting. This would indicate what their present Manager had had to contend with, and had not yet had time to fully overcome. A new engine and exhauster and boiler had been erected; as well as additional retorts, with regenerative furnaces. When the sulphate of ammonia plant, now on order, had been erected, the gas-works at Calcutta would have been fairly well modernized. All this took time, and they must wait patiently until after next June, before they could expect to reap the full benefit of all the alterations, renewals, and extensions. He might say here that he had the honour of meeting the Viceroy of India in the summer. His Lordship expressed himself pleased with the improved public lighting of Calcutta, and with the way in which the Company carried out their duties. He told Lord Curzon that, on his return to India, he would find a still further improvement in the public lighting of its chief city. Before concluding, he would read a paragraph or two from Mr. Watson's annual report to the Board, which he (the Chairman) thought would interest the proprietors. Mr. Watson wrote—

During the past year, we have made good progress in furthering the use of gas in all directions. We have extended the use of high-power lamps for street illumination, and the system has now been adopted by the Government of India for important street crossings. Our trials have been uniformly successful; and the police are advocating the use of these lamps for regulating traffic. We have also made steady progress with interior lighting with "Lucas" lamps, and have successfully fitted up two important churches in Calcutta, and thereby counteracted the efforts made for the introduction of the electric light into those places. Two important Government printing presses have also adopted "Lucas" lamps; and now we are pushing them for shop lighting. Inverted incandescent lamps are being brought into use for domestic lighting, with excellent results. There is an increasing idea of good taste for artistic gas-fittings; and this notion must be encouraged. With our new show-rooms and offices in Chowringhee, we are in closer touch with our consumers; and this undoubtedly will have good effects for the future.

Prepayment meters have now for the first time been introduced into Calcutta. In the opening stages, everything went well, until some bright wit suggested that the Gas Company were endeavouring to obtain payment for the gas in advance; and this temporarily checked our progress. We have now made another move, and 27 meters are in use with every prospect of further increase. It is most difficult to introduce anything new; and it requires patience and time to explain any innovations.

We have substituted cast-iron pipes, 18 inches in diameter, for the old French main in Lower Chitpore; and this important work was successfully carried out during the year. The only French mains remaining are in

Chowringhee Road; and they will be removed during the present year. [In a cable received on the 14th inst., it is notified that this work is now complete.] These will take away two bars to our proposal for a day supply of gas. When the day supply can be assured without inordinate increase of our leakage account, then our business will show greater advances. We are still troubled with drainage works; and it gives us constant anxiety. For the better lighting of the part of our district beyond the docks, we are erecting a gasholder for the storage of gas when the dock bridges are open. The gasholder has been made sufficiently large to take up the lighting of Garden Reach Municipality, which is likely to take place at no distant date. This work will give great satisfaction to the residents, whose complaints have been long-continued. The Port Commissioners allowed us, at a rental, to occupy a piece of their land at Kidderpore, as our action was looked upon as a public improvement. Fort William is gradually making the change from gas to electricity; but they are still using our gas to some extent. I do not think they will give up gas entirely; but this remains to be seen. What we lose here, can be made up in other directions.

Probably one of our greatest achievements during the year was the victory of gas over electricity in Harrison Road—the only street in Calcutta lighted with electric arc lamps. We offered 70 "Lucas" lamps in place thereof; and the Corporation of Calcutta accepted the offer. The terms of agreement are still under discussion; and we hope to have this important thoroughfare (which connects by road the two termini of the East Indian Railway and the Eastern Bengal State Railway) lighted with gas with as little delay as possible.

We have had an extremely busy year with so many extensions in progress; and this work is in addition to the ordinary routine of business, which has also increased so materially. But with so much help from the London office, under the Secretary, our efforts have been seconded in a very cheerful and willing manner. In a climate of heat and discomfort, with occasional floods and plagues of insects to add variety to life, it is something to know that at home we are being watched with so much interest; and it spurs us on to further successes. The staff and workmen have been constant in their endeavours to promote the success of the undertaking; and I have the greatest pleasure in fully acknowledging the ready assistance I have received.

He (the Chairman) did not think it would be possible for him to have read a more satisfactory report from the Manager, or laid before the proprietors a more gratifying report as to the state of the accounts, than he had done on the present occasion.

Mr. H. D. ELLIS seconded the motion.

The CHAIRMAN, replying to Captain D. PETERS, stated that before he was appointed Engineer, Mr. Watson had been seven years in the employ of the Company as Assistant-Engineer. He came to them from the Crystal Palace Gas Company.

The motion was unanimously adopted.

Moved by Mr. R. MILLER, and seconded by Mr. A. T. EASTMAN, a dividend was declared of 8 per cent for the year, free of income-tax, payable on Monday, Dec. 5, less the interim payment of 3½ per cent. last June.

The CHAIRMAN proposed, and Mr. H. HUNTRISS seconded, the re-election of the two retiring Directors (Mr. H. D. Ellis and Mr W. Williams); and this was heartily agreed to.

Both gentlemen having acknowledged the confidence of the proprietors,

The Auditors (Messrs. S. W. Savage and Frederick Seel) were, on the proposition of Mr. G. C. GOLDSMID, seconded by Mr. W. C. ELLISON, unanimously re-appointed.

The CHAIRMAN moved that a vote of thanks be given to the Manager, Assistant-Manager, Secretary, and the staff, both in Calcutta and London.

Captain PETERS seconded the motion, which was unanimously passed.

The SECRETARY, in responding, said it was cheering for his staff and himself in London to find that their work was appreciated, but it was doubly so to those men who were 6000 miles away, living and working in a climate which did not compare even with our own, to know that their efforts were also appreciated and recognized.

On the motion of Captain PETERS, seconded by Mr. ELLISON, the thanks of the shareholders were also tendered to the Chairman and Directors.

The CHAIRMAN's acknowledgment concluded the proceedings.

SALES OF STOCKS AND SHARES.

At the Mart, Tokenhouse Yard, last Tuesday, Mr. Alfred Richards conducted a very satisfactory sale, by order of Directors, of new issues of preference and ordinary gas and water capital. There was a markedly stronger demand; and the prices realized were all higher. The first lots offered consisted of ordinary £10 shares in the Worthing Gas Company, entitled to 7 per cent. dividend; and they fetched prices ranging from £13 17s. 6d. to £14 2s. 6d. per share. Some £10 "A" shares in the Tendring Hundred Water Company were next offered. These shares rank for a maximum dividend of 8 per cent.; but the last was at the rate of 4½ per cent. per annum. They were all sold at £10 to £10 2s. 6d. each. A parcel of £10 "G" ordinary shares in the Aldershot Gas and Water Company, entitled to a dividend of 7 per cent., was placed at £13 10s. to £13 15s. per share; some "G" 5 per cent. preference shares in the same Company fetching from £11 5s. to £11 12s. 6d. each. The last lots offered consisted of a new issue of £10 "C" shares in the Harrow and Stanmore Gas Company, ranking for a standard dividend of 7 per cent., subject to the sliding-scale; the last dividend on similar shares having been at the rate of £6 9s. 6d. per cent. They fetched £12 5s. to £12 12s. 6d. per share. At a sale by auction last Wednesday, by Mr. J. H. Thorpe, ten £10 shares in the Dunstable Gas and Water Company realized £17 10s. each. Some 4 per cent. perpetual debenture stock was recently offered for sale by tender by the Reading Gas Company. We are informed that the total tendered was more than three times in excess of the amount offered; while the average price realized was higher than that of any previous issue of this stock.

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GAS COMPANIES AND ELECTRIC LIGHT COMPANIES.

The current issue of the "Electrical Review" contains an article by their "Legal Contributor" dealing with the Chepstow case. It closes with the following remarks on gas and electricity supply companies.

Too much stress must not be laid upon the decision in this [the Chepstow] case. In the first place, whatever may be the real facts, it appears to have been decided upon the supposition that the only question before the Arbitrator was whether the mains had or had not in fact been laid too close to the gas-mains. As the case is reported, it does not appear that the Arbitrator was called upon to order the Electric Light Company to do the work or to pay the Gas Company for doing it themselves.

While upon the legal relationship of a gas company and electric supply company, it may be of interest to consider the question as to who is liable for damage caused if an explosion should take place in a street box, owing to the accumulation therein of gas which escapes from gas-mains. Under the present Electric Lighting Acts, and the regulations made thereunder by the Board of Trade, liability does not appear to attach to one authority more than another. Nevertheless, the onus is upon the electric lighting company to keep such boxes clear of gas. Thus, by the Board of Trade regulations (No. 34 of 1895), under the heading "Street Boxes," it is required that—

(*c*) Where street boxes are used as transformer chambers, reasonable means shall be taken to prevent, as far as possible, any influx of water, either from the adjacent soil or by means of pipes; and in the case of any such street box not exceeding 1 cubic yard in capacity, ample provision shall be made, by ventilation or otherwise, for the immediate escape of gas which may by accident have obtained access to the box, and for the prevention of danger from sparking.

(*d*) All street boxes shall be regularly inspected for the presence of gas, and if any influx or accumulation is discovered, the undertakers shall give immediate notice to the authority or company whose gas-mains are laid in the neighbourhood of the street box.

Although these rules impose upon the electric company the clear duty of seeing that gas is not allowed to accumulate, they say nothing upon the question of liability. The question must, therefore, be answered independently of statute. In the first place, neither gas nor electrical companies are exempted from liability for negligence. To whose negligence, then, can the explosion of a street box be ascribed? It seems that there must be negligence on both sides—on the part of the gas company in allowing their pipes to become leaking, on the part of the electric supply company in permitting the street box to become so defective as to allow of the percolation and accumulation of the explosive mixture. It is impossible to see how such an accident could be attributed to one or other company, unless, of course, it could be shown that the gas was fired, not by a short-circuit, but by a lighted match or other adventitious cause. Should the question ever arise in the Courts, the two companies could be joined as joint *tort feasors*.

LAMBETH WATER-WORKS COMPANY.

A Valedictory Report.

The Directors of the above-named Company have issued what may be regarded as their final report. They express their regret that they are not able to circulate the accounts with it, as usual; but the reason is that they have not been certified by the Official Auditor (Mr. Allen Stoneham). They go on to say that the accounts for the period from March 31 to June 24 are final, and some delay has not unnaturally arisen in arranging certain adjustments. To the balance applicable to dividend up to June 24 there is to be added £28,232 (less income-tax) for interest from June 24 to Sept. 1 on the compensation awarded to the Company; and a further sum for interest on money on deposit, &c., subject to current expenses. The proprietors have already decided that the profits to June 24 are to be divided in accordance with the general practice of the Company; and as the interest to Sept. 1 has been calculated at the rates of recent dividends, the same principle will naturally apply thereto. The Directors believe that the amount will be sufficient to pay a dividend in excess of the prescribed rates of 10 and 7½ per cent. per annum respectively; and they accordingly recommend that a dividend for the period from March 31 to Sept. 1 be paid at such rates, and that the surplus be distributed, as in the past, at the same rate per cent. on both denominations of stock on account of deficiencies in previous dividends. It is proposed to pay a portion of this dividend as soon as practicable, and to keep in hand a sufficient sum to meet contingent liabilities—any balance to be distributed as part of the dividend now recommended. The Court of Appeal decided that the Court of Arbitration were right in holding that the undertaking of the Company ought to be valued as subject to the obligation to contribute to the Chamberlain's sinking fund. The amount of compensation to which the Company became entitled was therefore £4,301,000. By the scheme, £347 17s. 6d. of water stock will be allotted in respect of every £100 of 10 per cent. stock of the Company, and £254 9s. of water stock in respect of every £100 of 7½ per cent. stock. Any surplus that may remain, after satisfying all claims upon the £41,000 reserved for the purposes specified in the scheme, will be distributed in cash, in the same proportions, except that any amount not exceeding £500 may be disposed of as the Directors determine. The stock will be transferred with interest accrued from Sept. 1 last, and a full half-year's dividend will be payable on March 1, 1905. The Directors add: "The Company have handed over to the Metropolitan Water Board a concern of considerable extent and of vast public utility, which was initiated and developed exclusively by private enterprise, and has thus entered on a new phase of existence after a growth of nearly 120 years. It will probably not be necessary to again call the proprietors together. It therefore only remains for the Directors to express their appreciation of the confidence which has been so generously reposed in them."

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BRADFORD WATER-WORKS ARBITRATION.

Tuesday, Nov. 8.

(*Before Mr.* J. H. HANSON, *Umpire.*)

A Nidd Valley Estate.

At the Surveyors' Institution, Westminster, an arbitration inquiry was opened to-day in regard to the compulsory purchase by the Bradford Corporation of an estate, known as the Low Woodale Estate, in the Nidd Valley, belonging to the devisees of a deceased lady named Mrs. Oxley. The Arbitrators were Mr. CHARLES GOTT for the Corporation, and Mr. C. R. FENWICK (Leeds) for the claimants.

Mr. FREEMAN, K.C., and Mr. BAIRSTOW appeared for the devisees; Mr. C. A. CRIPPS, K.C., M.P., and Mr. LAWRENCE represented the Corporation.

Mr. FREEMAN, in opening the case, stated that the portion of the estate in question was required by the Corporation in connection with their water undertaking. By various Acts of Parliament, they had obtained powers to construct water-works and acquire land in the valley of the Nidd; and they could not have selected a more favourable position than this for their purpose, as it was an ideal watershed with no pollutions around it. The stream called the Woogill went into the Nidd; but a catchwater would tap it, and convey the water away, as a subsidiary work, into the Corporation reservoirs. The result of this would be that they would be able to take the waters from the stream, which at the present time flowed down through a large portion of the devisees' estate until it entered the Nidd. The estate was known as Woodale and Winterside; and the lands had been in the family for more than 150 years. The first notice to treat was served in June, 1902, and the second in July this year; the latter relating to a further strip of land, the object being to get a road. As a matter of fact, though notice had not been given for this, by an arrangement the Corporation had been allowed to take the strip. They had been in possession, and a road had been made. The ground rent on the portion of the land taken was £6 18s. 8d., the agreed figure. Then there was also a tithe that was paid to Trinity College. The tithe on the whole property was £5 12s. 7d.; and on the part taken it was a portion of £2 9s. 10d. There was also vicarial tithe. In this case, the minerals had been reserved, and had been sold, he believed, to the Corporation. Before the estate was interfered with by the Corporation it was very compact; and undoubtedly its chief attractions were its sporting character and the very excellent water supply upon it. As to the question of the way in which the claim could be substantiated, there was first of all the basis of the agricultural value. They had meadows and pastures—rough and moorland. The value of the land for any purpose was not only for the present time, but it had a considerable capacity for development. They estimated that 40 years' purchase was the value at which it should be capitalized. They had to deduct the leasehold rent and the tithe rent-charge; and this brought them, in respect of the agricultural lands, to a valuation of something less than £4000. The sporting was taken in three parts. There was first of all the sporting on Woodale Moss or Winterside, which was 91 acres; and this they took at 4s. per acre; 613 acres of Woogill Moor, at 5s. an acre; and 108 acres of inland shooting, which was taken at 6d. per acre. In addition to this, there was the practical loss of the fishing on the stream, taken at a lump sum of £10 rent; and this they took at 33⅓ years' purchase. Then there was the question of severance, which was a serious one, for a very convenient and compact property had large portions on both sides of it cut off, and it was left with the river pastures reduced to quite a small estate of 209 acres and three farmhouses. The annual value of the lands severed by the new road was 10s. an acre. They were of opinion that in this case the allowance for the compulsory taking of the land should be 20 per cent. The lands let were depreciated by the loss of the fells for the sheep, and there was also a loss on cutting turf, all of which were permanent losses. The Corporation were not under any obligation to give water to the lands, but were entitled to take all water away; and it was extremely difficult for them to know how long the construction of the works might take. Council concluded by saying that the whole of the claim amounted to something like £15,000.

The following is a list of the expert witnesses called in support of the claimants' case, and the totals of their valuations: Mr. T. T. Wainwright, £14,871; Mr. J. Farrer, £15,929; Mr. J. Mason, £14,771; and Mr. E. L. Clare, £16,566.

Mr. CRIPPS urged that the highest possible multiplier would give a figure of about £3000 as the value of the property taken. So far as the rental basis was concerned, there was no very substantial difference between the parties; but as to the sporting rights they varied very much. Their value was nothing like 33⅓ years' purchase; the Corporation's figure was something like one-sixth of that of the claimants.

Wednesday, Nov. 9.

Mr. *Wise*, Solicitor, gave formal evidence this morning respecting the original deed under which the claimants held the property under a lease for 3000 years, and which was dated Sept. 26, 1609. This deed, however, was not in his possession; but he said he had another one containing a long recital of the original, which he promised to produce.

Evidence for the Corporation was then called.

Mr. *James Watson*, the Water-Works Engineer to the Bradford Corporation, said their scheme, which affected the property in question, had been constructed under his supervision. The object of the Corporation was a twofold one, first to get an enormous quantity of material and plant up to the works, and, secondly, for the ulterior purpose of bringing coal or stone to market. The Corporation were

CARBURETTED WATER-GAS APPARATUS

Merrifield—Westcott—Pearson Patents.

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WINDSOR ST. WORKS, BIRMINGHAM	2,000,000	KINGSTON, PA.	125,000	STRETFORD	500,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	PETERBOROUGH, ONT.	250,000	OLDBURY	300,000
COLCHESTER	300,000	WILKESBARRE, PA.	750,000	TODMORDEN	500,000
BIRKENHEAD	2,250,000	ST. CATHERINES (2nd Cont.)	250,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
SWINDON (New Swindon Gas Co.)	120,000	BUFFALO, N.Y.	2,000,000	YORK (Second Contract)	750,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	WINNIPEG, MAN.	500,000	ROCHESTER (Second Contract)	500,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000	COLCHESTER (Second Contract)	300,000	NEWPORT (MON.)	250,000
HALIFAX	1,000,000	YORK	750,000	TOKIO, JAPAN	1,000,000
TORONTO	250,000	ROCHESTER	500,000	PERNAMBUCO (Brazil)	125,000
OTTAWA	250,000	KINGSTON, ONT.	300,000	MALTON	150,000
LINDSAY (Remodelled)	125,000	CRYSTAL PALACE DISTRICT	2,000,000	DULUTH, MINN. (2nd Cont.)	300,000
MONTREAL	500,000	CATERHAM	150,000	BROCKVILLE (ONT.)	250,000
TORONTO (Second Contract Remodelled)	2,000,000	LEICESTER	2,000,000	SMETHWICK	500,000
BELLEVILLE	250,000	ENSCHEDE (HOLLAND)	150,000	GRAVESEND	300,000
OTTAWA (Second Contract)	250,000	BUENOS AYRES (RIVER PLATE CO.)	700,000	NEWPORT MON. (Second Contract)	250,000
BRANTFORD (Remodelled)	200,000	BURNLEY	1,500,000	TORONTO (Third Contract)	750,000
		KINGSTON-ON-THAMES	1,750,000	TORONTO (Fourth Contract)	1,000,000
		ACCRINGTON	500,000	MONTREAL, ONT. (2nd Cont.)	1,800,000
				HAMILTON, ONT.	400,000

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making a railway from Paleley to Lofthouse; and from Lofthouse to Angram they had made a new road. Along this a railway, 3-feet gauge, was now laid, which would ultimately be replaced by one of 4 ft. 8½ in. gauge. The whole of the works would probably extend over from 27 to 30 years altogether.

Mr. CRIPPS: It has been said that until the works have been constructed there may be some interference with the water supply of the farms on the Oxley Estate. Will there be any interference at all with the existing water supply?

Witness: None whatever. The water supply will not be interfered with in the slightest.

Proceeding, witness said that, as to the fishing rights, he had never seen or heard of anyone fishing in the Nidd.

In cross-examination by Mr. FREEMAN, witness repeated that, in his opinion, the construction of the works would not interfere with the water supply on the estate.

Mr. *Menzies*, Agent for Lord Walsingham's Yorkshire moors, said that, as regarded the condition of Woogill Moor from a sporting point of view, it was a very good small moor. It had plenty of heather; but it had been very much neglected, and was very steep. Woodale Moss Moor was also very small. He thought 2s. an acre was a very good price for the estate, and that 23 years' purchase would be fair if it was freehold. But having regard to the fact that it was leasehold, with rights over it by the landlord and the probability of working the stone, he considered it would be depreciated by one-half; and he put it at twelve years' purchase.

Mr. FREEMAN: Why do you put the figure at 2s. What is against the moor?

Witness: It is against it to be precipitous; and it is very much against it to be so much out of the world.

Mr. *R. B. Broste*, of Keighley, Mr. *R. Armitage*, of Bradford, and Mr. *George Renton*, of Harrogate, also gave evidence, and agreed in a total valuation of the estate at £3786.

After hearing speeches by Counsel, the Umpire reserved his award.

Thursday, Nov. 10.

Another claim came before the tribunal to-day. It was brought by by Mrs. A. A. Wright and Mrs. Jane Winn, who are sisters, and joint tenants of property known as the Scar House Estate in the Nidd Valley, against the Bradford Corporation. The same Counsel appeared as in the previous claim.

Mr. FREEMAN, in opening the case for the claimants, said they were also interested in other adjacent lands, but these formed no part of the inquiry to-day. The whole of the Scar House Estate was to be acquired; but in this particular case there would simply be questions raised of the value of the farm lands, their various qualities, low-lying moorlands, rough pasturage, pasturage, &c., and the value of the shooting. The Corporation had powers to construct three reservoirs, and for this purpose they required to take, among others, certain lands held by these ladies; and in the year 1893 they served a notice to treat in respect of land by the river for the purpose of constructing a reservoir. They included in the notice certain land for a tunnel, and also a detached piece of land, because it turned out it did not belong to the two ladies in common, but to one of them. In respect of this land an agreement was come to in December, 1893, between the owner of the estate and the Corporation, by which they were to be allowed to enter into possession of the land on payment of 4 per cent. interest on whatever sum was afterwards found to be its value. The land comprised in the notice was about 35 acres, and the Corporation entered upon it in July, 1894. They used it principally for the construction of a means of approach by tramway and roadway, and also in respect of the tunnel and conduit which would be absorbed in the reservoir when it was constructed. A further notice to treat in respect of the whole of the land was received in June, 1902, The entire area now in question was 551 acres. In respect of this notice, a claim was sent in last August. They claimed first that they had the land free from any reservation whatsoever except the right of the lessor to go upon it for the purpose of getting the minerals and turf. They claimed the shooting and fishing, and this had been surrendered by Mr. Yorke; there was no question about it between the parties. In 1903, the Corporation took possession of a number of acres for the purpose of making a road. It was obvious that the lands had their different values—those on the stream being more valuable than those on the moors; and the way in which his witnesses would deal with the matter was to divide it into two classes of land according to value. They first took the land comprised in the original notice to treat for the reservoir—land on the river, of special value. There were 35 acres; and they put it at £100 an acre. Next they took the meadow and pasture land (65 acres) at its agricultural value of £40 an acre. There was a little piece of rough pasture (13 acres), which was valued at £20 an acre. Then there was the remainder of the total area (438 acres), which without the shooting was valued at about £4 an acre, or at £15 an acre with it. There were certain deductions which would have to be made, such as leasehold rents and tithe rent-charges. The total value of the land was put at £12,910; and after the deductions, £12,564. Then there was the question about 10 per cent. for compulsory sale. The only items to be added were the interest on land taken for the reservoir site; and from this they would have to deduct the sum in respect of the rents received, which they took at 35 acres at 35s. per acre.

Mr. *T. T. Wainwright* said he had inspected the property for the purposes of this inquiry. He allowed 33⅓ years' purchase for the sporting rights, 40 years' purchase for the land, and 20 per cent. added for compulsory purchase. He valued the one reservoir site at £100 an acre; the meadowlands and pastures in the bottom lands at about 18s. per acre, throughout, there being 65 acres. The rough pastures he valued at about 10s. an acre. There were also 438 acres

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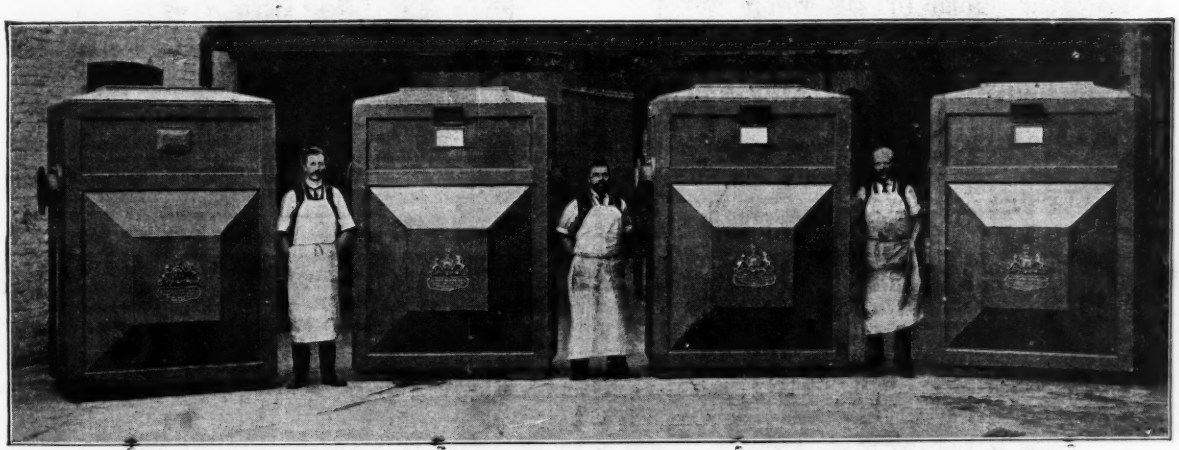

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of moorland, at 2s. an acre. The total rental value of the whole was £165; and that he took at 40 years' purchase. For the sporting rights he put the rental value at 4s. per acre. He added to this the lowland fishing, at 6d. per acre, and the fishing rights at the rate of £10 a mile double bank. His total valuation was £13,121.

Replying to Mr. CRIPPS, witness said he did not think the rights of the lessor would interfere with the land for sporting purposes. The covenants would not affect the value of the shooting.

Mr. *J. Maughan* testified to the sporting value of the estate, and further evidence was given by Messrs. *J. Farrar* and *J. L. Clare*, who valued the estate at £14,420 and £13,851 respectively.

Mr. CRIPPS, in opening the case for the Corporation, contended that the gross rental should be taken as the basis, and this, at 25 years' purchase, was an ample allowance.

Mr. *J. Watson*, the Water-Works Engineer to the Corporation, stated that there was stone adjacent to the property, and a quarry had been opened out. He had used the stone in the erection of a dam 400 feet long. There was stone in the valley which by means of a road could be worked, and had marketable value.

Friday, Nov. 11.

The case for the Corporation was continued to-day, when a joint valuation of the claimants' property by Messrs. Menzies, Broste, Armistead, and Renton was put in and supported in evidence by these gentlemen. The valuation showed a gross rental of £100 7s. 4d., which, with deductions for ground-rent, tithes, &c., came to £85 14s. 5d. This multiplied by 25 years' purchase came to £2143; and with 10 per cent. allowed for compulsory sale, the figure arrived at was £2357, which was reduced by £200 for necessary outlay upon farmhouses and buildings, &c. As to the sporting rights, 551 acres at 1s. 6d. an acre came to £40, which multiplied by 12 years' purchase amounted to £490. An allowance of 10 per cent. for compulsory sale made £49; the figures then standing at £539. The total valuation was £2696. Mr. Menzies, dealing with the property from the sporting point of view, allowed 10s. for a brace of birds, 6 acres to a brace; and the general evidence of experts called tended to show that hill farms were a deteriorating property in the district. A full price for the sporting rights was 1s. 6d. per acre.

After speeches from Counsel, the Umpire reserved his award.

Tuesday, Nov. 15.

The third and last Nidderdale case against the Bradford Corporation came before Mr. Hanson and the same Arbitrators to-day, when Mr. Simon Thompson, Miss Mary Thompson (his sister), and Mr. Matthew Mawer brought a claim in respect of 325 acres of land compulsorily acquired for water-works purposes, of which 236 acres belonged to the three claimants jointly under a 3000 years' lease, the residue of 89 acres being the freehold property of Mr. Thompson. The estate is known as High Woodale, and the leasehold was stated to have been in the family since 1715.

Mr. FREEMAN, in opening the case, stated that the minerals were reserved; full power being given to Mr. John Yorke, now the Bradford Corporation, to search for, get, and carry them away. The reservation did not, as in the other two cases, refer to the stone expressly. As regarded the leasehold portion, the term of 3000 years was identical with the other two cases. Mr. Yorke gave up the sporting and shooting over the leasehold part; but as regarded the freehold, he still reserved to himself the right of the sporting and shooting. The result of this was that he and Mr. Thompson had equal rights over the land. Part of the land was not only of agricultural value, but it had "adaptability;" and they took this at £100 an acre. Then they took meadow land and pasture at £40 an acre, and the rough pasture at £15 an acre. As to the moorlands, there were 143 acres at £5 an acre—that was two-thirds of 186 acres, which was the whole of the moors. They claimed altogether for the leasehold lands £5034; and with the sporting rights over the leasehold property the total was £6279. Allowing for compulsory taking 20 per cent., amounting to £1255, the value of the leasehold came to £7534. With regard to the freehold portion, the moorlands were put at £897, and £179 was allowed for 20 per cent. compulsory sale; making an addition of £1076, or a total valuation of the whole estate of £8610.

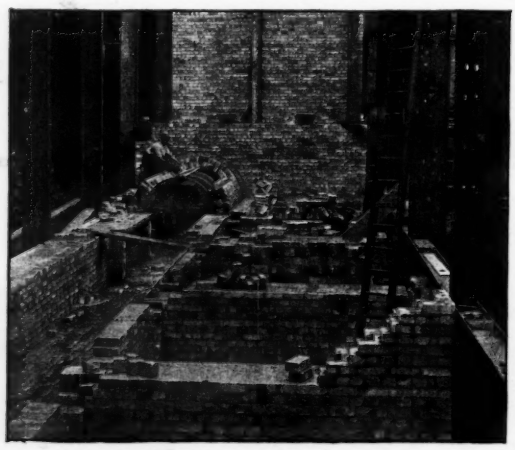
Among the expert witnesses called in support of the claimants' case were Messrs. *J. Farrer*, *E. L. Clare*, *J. Maughan*, *W. B. Boord* (the Agent for Mr. John Yorke), and *J. Mason*, who were practically agreed upon a valuation of £8610 as the total compensation to be given.

Wednesday, Nov. 16.

The case for the Corporation in reply to the claim was opened and concluded to-day.

Mr. *James Watson* gave a description of the area and of the reservoir site. He stated that the Nidd was not a river adaptable for the construction of water-works. The valley was very narrow, and the river for 3 miles up proceeded at a gradient of 1 foot in 52 feet, which was a very rapid fall; the result being that before they could have a reservoir a mile in length they would need an embankment 120 feet high. From his general experience and knowledge of cases in the Nidd Valley, he said the site was not an adaptable one. Until the foundations were proved, adaptability could have no weight or value. Unless there were special circumstances, a river like the Nidd, tumbling down at the gradient he had stated, could hardly be said to be adaptable for reservoir construction. Another objection was the tenure of the lands. The owner had only the surface rights; and there were other people who had them also. None of the lands had the first essential for water-works purposes—in fact, there was a distinct disadvantage in them for reservoir construction.

Mr. LAWRENCE (for the Corporation): We have heard it said that



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here has been some competition between Leeds and Bradford for the site. Are you aware that there has ever been such competition?

Witness: Never. There never was a proposal, an arrangement, or a suggestion. There is no foundation whatever for the statement, so far as the Bradford Corporation are concerned.

In further examination, witness said there was stone in some of Mr. Thompson's land, which he himself had seen and examined, said to be 8 yards in depth. There was no such thing; but there was stone of a kind in all these lands, and there was very good stone on Mr. Thompson's land that would be suitable for the purposes of the works.

Cross-examined by Mr. FREEMAN, on behalf of the claimants, witness said there were not 24 acres in the reservoir site on the estate, only 15½ acres. They intended to construct a reservoir, and though special adaptability had not been discovered for works of this character, they had scheduled the land for the purpose. With regard to the sporting rights, to say that hundreds of fish had been taken out of the stream over the limestone beds and the shale was not correct. They were not there now, never were there, and never would be.

Mr. *R. Menzies*, Agent for Lord Walsingham, said he had inspected the estate from the sporting point of view. There was fair heather on the moors, but the strips were narrow and steep. The property, in his opinion, was affected by the joint ownership, which certainly depreciated it, for very few people would care to buy into a joint arrangement. He took two-thirds of the acreage and valued it, having the knowledge that somebody else had the right to walk over the other third. He valued the whole of the sporting rights at £159 6s. 10d., including 10 per cent. for compulsory purchase, and giving 12 years' purchase.

Mr. *Gowland*, Solicitor to the claimants, said the shooting over the whole of the estate, both freehold and leasehold, was let to a Mr. Rogers, who paid £25 a year rent. Mr. Thompson paid the rates and taxes. The agreement was a verbal one.

Mr. *R. Armistead*, a surveyor, gave it as his opinion that the highland farms were a deteriorating property, so far as the rental value was concerned. To his knowledge they had been going down for 35 years, and were still doing so.

Evidence was also given by Mr. *R. B. Broster* and Mr. *G. Renton*, surveyors and land agents. The joint valuation of these and the other witnesses amounted to £2038 for the lands and £169 for the sporting rights; the total being about £2200.

Mr. CRIPPS, summing up for the Corporation, contended that adaptability did not arise in a case of this sort. If it did, an enormous discount must be made because the claimant had not the subsoil, the mines and minerals, and the right to take the stone. As regarded the shooting rights, someone else had the free, if not the exclusive, use of the site. The value of the shooting was nominal, and nothing could be claimed for sporting rights by Mr. Thompson on what was called the manor allotment. He submitted that the valuations of his witnesses were an ample amount to award the claimants.

Mr. FREEMAN having replied for the claimants,

The UMPIRE reserved his award.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

A distinguishing feature of the selection by the Committee of the Western District of the Scottish Junior Gas Association of the gas-works to be visited by them this season, is that in all the cases the works are quite new ones. They began with the Granton works; to-day they have been to Kilmarnock; and on the 25th of February they are to be at Provan. It is true that at Kilmarnock they had a look in at the old works, which, by the way, are not old in the sense of being out of date; on the contrary, they are, if not fitted with such modern appliances as coal-handling machinery and the like, quite up to-date in all that pertains to the economical production of gas, and are in the most perfect condition as regards repair and maintenance. Without knowing the figure or percentage of the expenditure upon renewals and maintenance, it is quite evident, from the condition of the works, that the Corporation of Kilmarnock make a most liberal allowance upon that head. Perhaps this assumption may be qualified to some extent by a recognition of the value of good management; for it is scarcely open to doubt that works which are habitually well looked after, and, I may say, affectionately cared for, will require less actual outlay upon their maintenance than if they were neglected or abused. There is evidence all around that in Kilmarnock the greatest care is taken of everything. As a means to an end this is commendable; and the end, in the case of Kilmarnock, is that they have, in thirty years, increased the value of their gas undertaking by £60,000, while keeping abreast of the times in every respect. But it may be taken for granted that it was not to see the old works that the Juniors went to Kilmarnock; it was the new works that was the attraction. These, as was pointed out in the "JOURNAL" on the occasion of their opening in May last, are most spacious, complete in every detail, capable of easy extension, and equipped with just such machinery and appliances as are desirable in works of their size. In every particular they bear trace of careful thought and of skilful application of faculties which only come of long experience and observation. The Corporation may well be proud of their gas-works; and the Junior Gas Association should be grateful for the opportunity of seeing them. That this was the feeling entertained by the visitors there can be no doubt. They saw the works as they are, and were shown what they will be when the railway and other equipments not yet provided are introduced; and the whole was a valuable education for students of engineering. The Corporation gave them a most hearty welcome, and thus added to the pleasure and comfort of a well-spent afternoon. It is a tribute to the wisdom of the Corporation that, in embarking upon an electrical undertaking, they have placed it alongside the gas-works—thereby making it easier for the one concern to render assistance to the other; and it was a happy thought to include the electric lighting works in the visit. There is much valuable and

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delicate machinery in these works, the opportunity of seeing which must have been highly appreciated.

There are some things in this world which come not with observation. Probably few people, however, would include in that class a gas transfer. Such events are usually much canvassed beforehand; the negotiating parties being generally at loggerheads, and the *pros.* and *cons.* of the transaction being subjects of general discussion in the community interested, as well as attracting attention in circles outside the immediate interest. When agreement has been come to, and the handing over takes place, it is customary for the municipal authorities to indulge in a shout of victory to mark their taking possession. In Airdrie, however, they do things differently. On Friday of last week, the undertaking of the Airdrie Gaslight Company passed into the hands of the Corporation with no more ceremony to signalize the event than there is at the coming of the new moon. Indeed, so little has been said of it that the fact that a transfer was about to take place, as mentioned in these "Notes" on the 29th of March last, was all but forgotten. It was agreed upon last spring, to take effect on the 11th of November, upon payment by the Corporation of a sum of £61,300; the stocks to be taken at a valuation. The Corporation appointed a Committee, who, along with the Directors of the Company, have jointly managed the undertaking since the 15th of May. All that took place on the 11th inst., therefore, was that the Directors ceased to have any further interest in the concern, except in so far as the winding up of the affairs of the Company is concerned; and the Corporation stepped into their places, and as soon as the exact amount due is ascertained it will be paid over. In the meantime, the general community are oblivious of any change in the arrangements for their gas supply. This is an interesting episode, and is worthy of being called attention to. The Airdrie Gaslight Company was formed so far back as 1830. In 1865 it was formed into an unlimited Company, under the Companies' Act of 1862. It returned its capital at £27,976 at the beginning of this year. It has an annual output of 65 million cubic feet of gas. Mr. D. Vass, who was a long time at Portobello, is the Manager.

The Works Committee of the Edinburgh and Leith Gas Commissioners met last Monday to consider the recommendations of their Sub-Committee with reference to the Commissioners dealing in gas stoves and appliances, which were given in last week's "JOURNAL." By 16 votes to 6 the Committee adopted the recommendations, which will now come before the Commissioners. Lord Provost Sir Robert Cranston was one of the minority.

The death of Mr. Peter Watson, who was for long Gas Manager at Stirling, removes from the gas world one who was among its later pioneers. He was an enthusiastic, though not a prominent, member of the North British Association of Gas Managers. When the Association visited his town, as they have done frequently, he was unremitting in his attention to their wants. On the occasion of the visit in 1887, in particular, it is recollected how solicitous he was to have a full gas supply for the illustration of a paper read by Mr. W. Young, of Peebles, upon the purification of gas in closed vessels. His length of service entitles him to esteem; and so did his gracious presence, his generous spirit towards his colleagues, and his zealous attention to duty. These qualities were recognized when he retired from active service, for, on the part of the Company whose servant he had been for so many years, he was voted a retiring allowance, and on the part of his colleagues he was made an honorary member of the North British Association of Gas Managers—an honour which is accorded to only a very few.

Once more there is trouble at Falkirk over the new gas-works. It appears to have risen quite innocently, and might have been easily got over; but it has been so handled that it has assumed an ugly aspect. The affair has been in progress since the middle of August, but it was not known outside the circle of the Town Council and officials until last night, when it was sprung upon the community by the holding of a special meeting of the Council to consider it. About seven years have been spent in arranging for the new gas-works—perhaps I should say mostly misspent, for if the Council had known their own mind upon the subject, it cannot be doubted that the works would have been in use before now. In the beginning of August last, what was thought to be the last item to be arranged was adjusted, when an agreement with the North British Railway Company as to the formation of a railway siding to the works was signed. By that time the Engineer and Manager (Mr. W. M'Crae) had, on the instructions of the Council, not only had plans and specifications for the works prepared, but had received tenders for the erection of a portion of them, including the retort-house. On the agreement being signed, the Town Council, as if to make up for lost time, precipitately ordered Mr. M'Crae to accept the tenders; and to have the erection of the retort-house proceeded with. This was done, the work having been commenced on the 12th of August. Six days later it was discovered that the Railway Company were arranging to construct their line at a level 4 feet higher than had been assumed. This arose from the fact that the Company, while constructing a railway to serve the gas-works, had arranged to carry the siding further, to accommodate other parties, and particularly the Falkirk Iron Company. It is to suit this Company that the level is to be raised. The effect of this step is to require either that the retort-house shall be partly underground, or that it shall be raised to the new level, involving extra cost. This was a state of matters as to which there needed to have been no fuss; but assuredly a great mountain of difficulty has been raised out of it. The Council have not yet considered the situation on its merits. Last night's meeting was wholly devoted to a discussion of the personal question as between Mr. M'Crae and his Convener (Mr. H. Russell) as to which of them communicated to the other the knowledge that the levels were to be altered. Mr. M'Crae and his Assistant (Mr. W. A. White) by instructions prepared reports upon this point; and they were laid before the Council last night. In them both gentlemen declare that they separately received the information, on the 18th of August, from Mr. Russell. Mr. Russell in the Council denied point-blank that he ever told Mr. M'Crae or any other man that he knew of any alteration of the plans. So direct a

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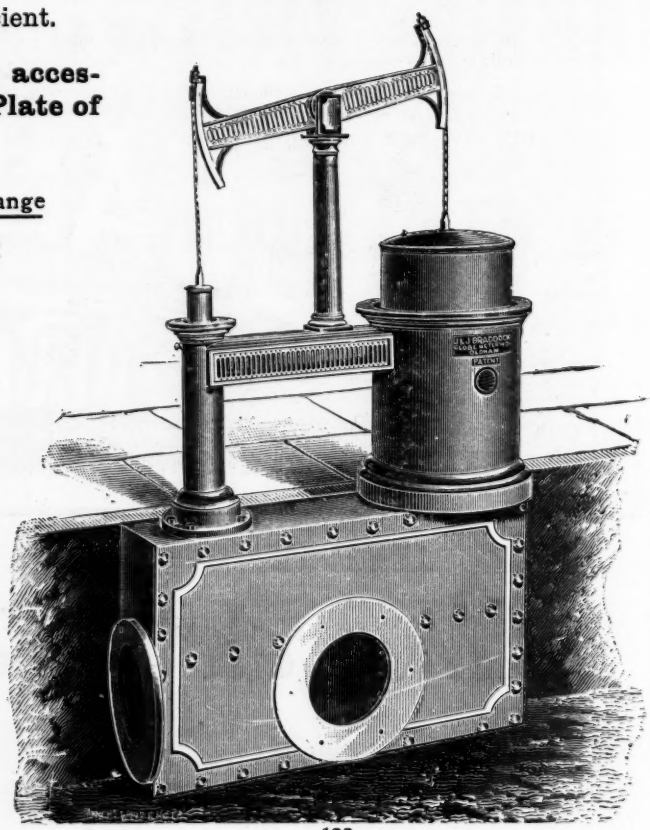

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conflict of statement raised a serious situation. The Council had a long and heated discussion, and, in the end, on the statement that they had not yet the plans of the Railway Company before them, they adjourned the meeting until these should be procured. If there be any excuse for the Council drifting into this personal matter, instead of taking up the business in a businesslike way, it is to be found in the assumption that it has been agreed to raise the level of the retort-house by 3 feet, without the sanction of the Town Council or the Dean of Guild Court. Taking Mr. M'Crae's report, which is supported by Mr. White, that stands in this position—that on the 18th of August Mr. Russell said that Mr. M'Crae should look into the matter at once; that on the following day he and Mr. White travelled to Edinburgh, where they had an interview with one of the Railway Engineers, from whom they ascertained that the level of the railway was to be altered; and that on the 22nd of August, when Mr. M'Crae and Mr. White were engaged in surveying with a view to ascertaining whether they could adjust their levels to those of the Company, Mr. Russell came on the ground, and on it being explained to him what they were doing, he raised no objection, which they took to mean that he agreed to the alteration. When this point is reached, the further one emerges that it was an alteration which had not been sanctioned in a constitutional manner; and it seems to be here that Mr. Russell feels the shoe pinching, because the charge is made against him that he ought to have called the Committee together whenever he knew what was going on, and reported to them. Where the swords cross is that Mr. M'Crae says he received his information from Mr. Russell, and acted on his instructions; and that Mr. Russell says he did not know that the levels were altered, and that Mr. M'Crae did not report to him that they were so. In Mr. Russell's attitude, however, there is to be found this—that he admits having asked Mr. M'Crae if his levels were right, although he says he did so to keep Mr. M'Crae correct; and there is, further, his statement, made in the Council, to the following effect: "If you walk along the banks of the canal, you will find works situated as ours would have been had we gone down to the levels intended. It has come as a Godsend to the town that the works are to be on a higher level." So that we have Mr. Russell approving of the alteration, but denying responsibility for it; while his admission of the question he put to Mr. M'Crae gives rise to doubt upon his whole position. Mr. Russell is on the horns of a dilemma, off which he will find it difficult to get. In addition to the reports by Mr. M'Crae and Mr. White, a joint report was also called for by Mr. Ronald (who he is I do not know) and Mr. M'Crae, as to the cost that will be involved by the alteration. This report was also submitted last night, and is to the effect that extra brick and concrete work will cost £164 10s., and extra banking up £209 2s. 9d. —together £373 12s. 9d., but that there will be a saving of £23 in connection with the foundations of the chimney and coal-breaker, which will make the total extra cost £350 12s. 9d.; that the other buildings will not be affected; and that the large area to be made up will form a free coup for the refuse produced at the gas-works for several years to come, thereby bringing about an annual saving. This report reduces the incident to small dimensions indeed, particularly so when we have Mr. Russell telling the Council, as he did last night, that they would save the extra cost in the first two years. With this confession, there can only be amazement at Mr. Russell taking up the position he has done.

Yesterday the settlement was intimated to Lord Low, in the Court of Session, of the action by David Hill, riveter, residing at 74, Reid Street. Bridgeton, Glasgow, against the Barrowfield Iron-Works, Limited, referred to in these "Notes" on the 31st of May last. The pursuer was injured on Aug. 24, 1903, by the fall of an iron girder while he was working for the defenders in the erection of a gasholder at the Dumfries Corporation Gas-Works. He sued for £500 as damages. The claim has been settled by the defenders agreeing to pay £130 and expenses.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Nov.* 19.

Sulphate of Ammonia.

Although there has been good demand, it has not been sufficient to continue the rapid advance of last week. All parcels offered have, however, been readily disposed of, at a slight advance towards the close, and the quotations are £12 10s. per ton f.o.b. Hull, £12 12s. 6d. per ton f.o.b. Liverpool, and £12 13s. 9d. per ton f.o.b. Leith. For December, makers require an advance of 2s. 6d. per ton. Considerable attention has been given to the forward position, and £13 per ton has been paid repeatedly for delivery over the spring months; but so far consumers are slow in bringing themselves to face the higher level of prices. For July-December delivery, makers require £12 10s. per ton, f.o.b. Leith.

Nitrate of Soda.

This article is very firm in all positions. Spot prices are 11s. to 11s. 3d. per cwt., according to quality. For spring delivery, 11s. 3d. per cwt. is generally quoted; and equal to 10s. 4d. to 10s. 6d. per cwt., according to quality, has been paid for autumn, 1905, shipment cargoes. The large Continental dealers, who have already bought 1906 and 1907 shipments at the high level of prices, are now inquiring for 1908 shipment.

LONDON, *Nov.* 19.

Tar Products.

Business has been fairly good during the past week; and prices as a rule show signs of improvement. In benzol, business has been done in 90 per cent. at 10½d. f.o.b. London; while 50-90 per cent. has been sold at 8d. per gallon in the North, and makers now ask 9d. for December delivery. Some small quantity of toluol was sold at 7½d. f.o.b. London for prompt shipment. In solvent naphtha, the market is

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firmer; and the demand continues good, especially in London for home consumption. An improved inquiry is also reported for the heavy qualities, with a special specific gravity, for both prompt and forward delivery. Anthracene is decidedly quiet. Consumers now only offer 1¼d. to 1⅝d. per unit for 40-45 per cent. "A" quality; while "B" quality is absolutely unsaleable. In carbolic acid, the demand continues very strong; and makers in the North of England report sales of 60's for January-June at 2s. 3d. per gallon. In London, this price is reported to have been declined; makers believing that higher prices will rule later on. The demand is certainly strong; and there is a pretty general opinion that still higher prices will be realized. Crystals remain in about the same position. There are several inquiries in the market; but makers here appear to be fairly well sold for prompt delivery, and are not at all anxious to offer forward. So far as London is concerned, prices for creosote are well maintained, owing to there being a very brisk demand for export; but in the North of England the market is quiet, and makers show rather more anxiety to sell for forward delivery. Pitch continues firm. A considerable business was done early in the week at 35s. One of the largest London makers realized 36s. 6d. for forward delivery; but they decline to sell any more at present under 37s. 6d. The demand for Yorkshire pitch also continues good, especially for forward delivery. From South Wales, there have been several inquiries; but consumers are not at all disposed to pay the prices asked by manufacturers, and do not seem particularly anxious about their supplies. The demand at present is principally for January-June next year; and so far as prompt is concerned, there does not appear to be any scarcity of supplies.

The average values during the week were: Tar, 18s. to 21s. 6d. Pitch, London, 34s. 6d. to 35s. 6d.; east coast, 33s. 6d. to 34s.; west coast, 31s. 6d. to 32s. 6d. **Benzol, 90 per cent.**, 10¼d.; 50-90 per cent., 8d. to 8⅛d. Toluol, 7⅛d. to 7½d. **Crude naphtha**, 3⅛d.; **solvent naphtha**, 9d. to 9⅛d.; **heavy naphtha**, 10d. to 10⅛d. **Creosote, London**, 1⅞d. to 1 15/16d.; North, 1¾d. to 1⅞d. **Heavy oils**, 2⅛d. to 2⅜d. **Carbolic acid, 60 per cent.**, 2s. 2½d. to 2s. 3d. **Refined naphthalene**, £4 10s. to £9; **salts**, 21s. to 22s. 6d. **Anthracene**, "A" quality, 1½d. to 1⅝d.; "B" quality, unsaleable.

Sulphate of Ammonia.

This is decidedly firmer; and there is very little offering for either prompt or forward delivery. The Gaslight and Coke Company are not offering just at present; but the nominal quotation may be taken as £12 15s. for December delivery, while it is reported that they have declined £13 for January-June. The South Metropolitan Company are not offering; but the nominal price may be taken as £13 on their own terms for December delivery, at which price it is probable they would sell a small quantity. In Hull, business has been done during the week at £12 8s 6d. and £12 8s. 9d.; but makers now ask £12 10s. for prompt delivery, and decline to quote forward. It is very difficult indeed to fix the price at Leith. Business was done early in the week at £12 12s. 6d.; but the value may be taken as £12 15s. for prompt delivery, although there is really very little offering. There is a strong inquiry for January-June; but makers as a rule decline to quote over this period.

COAL TRADE REPORTS.

Lancashire Coal Trade.

The colder weather has given a steady impetus to the trade in house coal. More orders have been received at the Lancashire collieries during last week than for months past. The demand for engine fuel has also been on an improving scale, both for round and slack qualities. The shipping trade keeps steady. Railway and municipal corporation contracts having for the most part been made up to well into the New Year, there is nothing to say with respect to such contracts, except that deliveries are steadily made in increased quantities. Altogether, however, the outlook is fairly promising. Prices remain on the old level. The quotations are: Best house coal 13s. to 14s., secondary 11s. to 12s., common 9s. to 10s. per ton at the pits; best steam and forge coal 8s. to 8s. 6d., secondary 7s. 6d. to 7s. 9d.; best slack 6s. to 6s. 6d., secondary 5s. to 5s. 6d., common 4s. to 4s. 6d. The coke trade is quiet.

Northern Coal Trade.

There is a steady demand for coals for this season of the year; but for one or two qualities it is less than is sometimes experienced. In steam coals, best Northumbrian kinds are quiet at 9s. per ton f.o.b., second-class steams are from 8s. to 8s. 3d., and steam smalls are 4s. to 4s. 3d. The demand is less from the Baltic; but there is some counterbalance in the increased quantity that is being sent to the East. In the gas coal trade, there is now a very strong demand, which in a fortnight will reach its highest point for this season. Deliveries of coal are well maintained on the long contracts; but they take up the bulk of the production of the collieries, and thus make the price firm for any additional contracts. Good Durham gas coals vary from about 8s. to 8s. 3d. per ton f.o.b., with occasionally both a higher and a lower quotation by certain collieries. Coke is firmer; but gas coke is more plentiful, and at inland centres is easier in price, though the chief exporters maintain the quotations.

Scotch Coal Trade.

The trade has shown no sign of improvement as yet. Ell is very plentiful. Splint keeps steady, both in demand and price. The prices quoted are: Main 7s. 3d. to 7s. 6d. per ton f.o.b. Glasgow, ell 8s. to 9s., and splint 8s. 9d. to 9s. The shipments for the week amounted to 225,901 tons—a decrease of 4928 tons upon the preceding week, and of 17,674 tons upon the corresponding week of last year. For the year to date, the total shipments have been 10,163,924 tons—an increase of 368,490 tons upon the corresponding period of 1903.

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Increased Storage at the Darlington Gas-Works.—The new holder at the Darlington Gas-Works has been informally brought into use. It has a capacity of 1,250,000 cubic feet, and will increase the storage to about 2 millions. The cost of the holder and tank was about £22,000. The present daily output of gas is rather more than 1½ million cubic feet.

Salford Gas, Electricity, and Water Profits.—The Gas Department of the Salford Corporation have made a profit of £27,540 on the financial year's working; being a decrease of more than £3000 on that made during the previous twelve months. In the Electricity Department, the profits were £3774, against a deficiency in 1902-3 of £2394. The water profits amounted to £4000—a decrease of more than £1000.

The Dangers of Acetylene.—In the "JOURNAL" last week, we reported an explosion of acetylene by which a tailor named Brennand was so seriously injured that his life was despaired of. He went with his son into a "lean-to" shed, in which an acetylene gas-generator was placed. He carried a lighted candle, and was manipulating the apparatus in order to get a better light when the explosion occurred; and it cost him his life. At the inquest, the Jury returned a verdict of "Accidental death," and added that in their opinion acetylene apparatus ought to be placed where it was not necessary to use artificial light to examine it.

The Incandescent Lighting of the New Streets into Kingsway.—The Works Committee of the Westminster City Council have decided to revoke their previous decision to light the new streets leading into Kingsway with incandescent gas-lamps of 700-candle power on 20-feet columns. While this system will be carried out in Kingsway, as has already been done in Aldwych, lamps of the type ordinarily used in the district will be placed in the side streets. The cost under the new scheme is estimated as follows: Kingsway, 7 lamps, cost of erection (including new columns) £20 each; annual maintenance, £15 10s. 5d. each. Side streets, 29 lamps, initial cost (new lanterns only) £4 2s. each; annual maintenance, £5 7s. 9d. each.

Brumby and Frodingham Water Scheme.—A Local Government Board inquiry was held at Frodingham last Tuesday into the application of the Brumby and Frodingham Urban District Council for sanction to borrow £15,000 for purposes of water supply, including the construction of works in the parish of Appleby. The evidence given by Mr. A. Atkinson, the Engineer who had been consulted, and Mr. G. S. Sowter, the Clerk to the Council, showed the population of the area to be 2400, and the acreage 4066. The assessable value was £41,733, the outstanding loans £1330, and the rates (including poor and general district rate) about 2s. 11d. in the pound for the year—1d. in the pound producing £156. They asked for the repayment of the loan to be spread over fifty years. The present supply is obtained from surface wells, which, besides being short, is liable to pollution.

The Improved Public Lighting at Reading.—On the occasion of the election of the Mayor of Reading for the current year (Mr. M. J. Sutton), the Deputy-Mayor (Mr. A. H. Bull), in moving the necessary resolution, referred to the work of Mr. G. R. Jackson, the outgoing Mayor, during his term of office. He said probably the greatest thing which had been done had been the improvement in the lighting of the town. Mr. Jackson, as a member of the Highways Committee, knew that for years they had been endeavouring to bring about the better lighting of the town; and he (Mr. Bull) now claimed that Reading was as well lit as any town in the United Kingdom. There was only one complaint; and that was that there was too much light. Mr. Jackson also referred to this matter in his review of the work of the year. He said he could not speak too highly of the improvement which had been brought about by the new system of lighting compared with the old. He did not say they had too much light, but they had sufficient.

South Holderness Water Supply.—At a recent meeting of the Hull Corporation Water and Gas Committee, it was reported that the Local Government Board Inspectors visiting South Holderness in connection with the water supply to the district had had an interview with the Chairman, Deputy-Chairman, and Water Engineer (Mr. F. J. Bancroft) regarding certain proposals which they understood had been made for supplying some portions of the Holderness area with water from the Corporation works. The inquiries of the Board's representatives, it was stated, were chiefly directed to the question of whether the yield from the springs belonging to the Corporation was such as to enable them to provide a supply sufficient to meet the requirements of the Holderness district; and, if so, as to the practicability of giving such a supply. At the conclusion of the interview, the Inspectors visited the Springhead and Cottingham pumping-stations, and also Dunswell. The Water Engineer submitted a report as to the practicability of the Corporation supplying the South Holderness district, including Hornsea; and ultimately both reports were ordered to be entered on the minutes.

Tees Valley Water Board.—The report of the Auditor to the Tees Valley Water Board for the six months ending Aug. 13 last has just been issued to the Corporations of Stockton, Middlesbrough, and Thornaby. The accounts show the capital expenditure for the half year to have been £97,213, bringing up the total cost of the undertaking to £2,399,845. During the half year, £69,000 was received on capital account; the total amount received up to date being £2,372,785, or £27,060 less than the sum expended. The revenue account shows the income to have been £50,297; being a decrease of £501 compared with the preceding half year, and an increase of £1904 compared with the corresponding half of 1903. The expenditure on revenue account amounted to £10,146; being an increase of £290 compared with the preceding half year, and of £754 compared with the six months ending Aug. 13, 1903. The net revenue account is debited with several payments for interest, and is credited with the interest allowed by the bank. After being dealt with in this manner, there remains a balance of £61,569, including £21,260 brought forward. Of this amount, £39,000 was paid to the Corporations during the half year; leaving £22,569 to be carried forward, £21,000 of which has since been paid to the Corporations.

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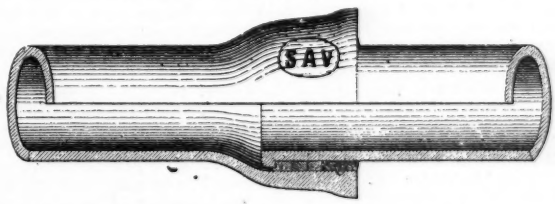

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Scalby District Council and the Water-Works.—At a Local Government Board inquiry held on Thursday, into an application by the Scalby Urban District Council for sanction to borrow £3500 for the purchase of the local water undertaking and extensions, Mr. J. E. Ellis, M.P., one of the witnesses, said that though the Water Company was a good honest 4 per cent. property, the shareholders were merely asking for the amount of their capital—£3000—as the price of purchase.

The Whitwood District Council and the Deanhead Reservoir.—At the last monthly meeting of the Whitwood District Council, the minutes presented of a special meeting showed that a report was read from an engineer with regard to the proposed joint purchase of the Deanhead reservoir by the Whitwood and Castleford District Councils. It was stated that the estimated outlay would be £120,000. It was agreed that the liability involved was far greater than had been anticipated; and it was therefore resolved to abandon the scheme.

Borough of Portsmouth Water Company.—The report of the Directors of this Company for the half year ended Sept. 30 shows that the available balance on the profit and loss account is £27,980, out of which the Directors recommend the payment of the full statutory dividends. This, after deduction for void houses, &c., will leave a balance of about £9790. The Directors recommend that of this latter amount a sum of £500 shall be carried to the arrears of dividend fund. A balance of about £9290 will remain to be carried forward.

Newhaven and Seaford Water Company.—At the recent annual general meeting of this Company, the report presented showed that a profit of £2268 had been realized in the twelve months ended the 29th of September last, and that the balance available for distribution was £2120. The Directors recommended a dividend of £4 10s. per cent. on the "A" capital, and of £3 3s. per cent. on the "B" capital, both free of income-tax. After payment of these dividends, there would be a balance of £499, out of which it was proposed to place £100 to the reserve, write off £200 for depreciation, and carry the remainder forward.

Fatal Explosion of Gas-Tanks in Chicago.—News reached England last Saturday from several sources of a terrible explosion which had occurred the previous morning in the storage-house of the People's Gas Company. The accounts of the accident all differ; but it appears that a small gas-tank, used for the lighting of railway carriages, exploded, and this caused the ignition of the gas in about twenty others, which blew up, and wrecked the premises in which they were contained. The large gasholders of the Company were imperilled, and their contents had to be allowed to escape. At the time of the despatch of the telegrams, eight bodies had been recovered from the wreckage; and it was thought that ten others were still buried.

Advertising the Gas Exhibition in the Provinces.—We notice that Mr. C. E. Botley, of Hastings, is determined that the users of light and power in his town shall not be ignorant of the fact that there is much to interest and instruct them at the Earl's Court Exhibition. By an advertisement he has inserted in a local paper, he points out that gas is the cheapest and best agent, without any subsidy from the rates, for lighting, heating, cooking, and motive power. The Gas Company's consumers who may be visiting London are recommended to see the exhibition, free tickets of admission to which are supplied on application at their offices and show-rooms. This method of making the exhibition more widely known may be strongly commended to others.

Serious Riot at Rio de Janeiro.—On Sunday, the 13th inst., there was serious rioting in Rio de Janeiro as the result of the publication of regulations putting in force a compulsory vaccination law recently passed by Congress. Troops were called out to disperse the mob, and they charged repeatedly; but the crowd rallied at several other points and threw up barricades. The water-mains were cut, the street-lamps destroyed—the city being plunged in darkness—tramcars set on fire, the telephone wires cut, and all traffic was brought to a standstill. It is reported that an attempt was made to destroy the gas-works. Owing to the effectual measures taken by the authorities, the trouble was suppressed and order restored by Tuesday; but not before seven persons had been killed and about thirty wounded.

Gas Affairs at Doncaster.—The annual exhibition organized by the Doncaster Corporation, and carried out under the supervision of the Manager (Mr. R. Watson), was formally opened last Wednesday, at a gathering over which the Mayor (Mr. G. Smith) presided. The Committee have had the valuable assistance, as on previous occasions, of several hardware traders in the town. The opening ceremony was performed by Alderman Wainwright, the Chairman of the Gas Committee. Before he did this, however, he thanked the exhibitors for the help they had rendered. He said the Gas Committee were very much indebted to them, and appreciated the efforts they had made. They hoped also that they would be rewarded, as they deserved to be, by the sales. The Committee's object was to increase gas lighting and the sale of stoves and ranges; and in doing so they thought they deserved the thanks of the community, because they were getting rid of the servant difficulty. He went on to say that the object of the Committee was not to extend municipal trading; they must have everything up to date, and the best manufacturers were represented. It would be the aim of the Committee, as trade developed, to cheapen the cost of the production of gas. The Committee might congratulate themselves on having an excellent Gas Manager in Mr. Watson. Mr. W. Clark, in seconding a vote of thanks to the Mayor for presiding, said he thought the Gas Committee was the most businesslike one in the Corporation; and the business they meant to do was to do the very best they could for the gas consumers. The Manager was only too glad to welcome anybody at the works who sought information. He was invariably courteous, and was pleased at any time to give all the information he could.

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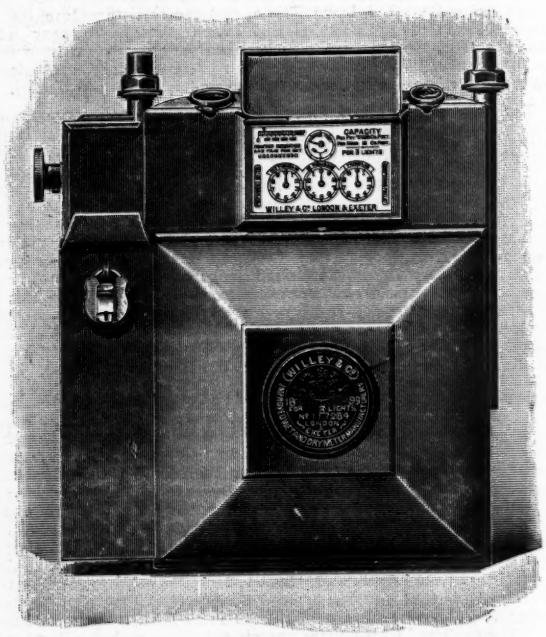

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Messrs. Joseph Taylor and Co., of Bolton, have received an order for a solid plate lead saturator for the Fleetwood Gas Company.

In the "JOURNAL" for the 1st inst., it was notified that steps had been taken to form a Cricket League between the clubs of the different Gas Companies in the North of London. We learn from Mr. C. O. Banks, the Hon. Secretary, that the adjourned general meeting of the League was held at Tottenham on the 3rd inst., when the chair was taken by Mr. Edwards, of Enfield. All the clubs competing were fully represented. The Hon. Secretary said he was pleased to inform the meeting that several of the officials of the different Companies were taking a great interest in the League; Mr. A. E. Broadberry having consented to become the President. He hoped at the next meeting to be able to submit a long list of patrons, and to inform the members what he had done in reference to procuring a shield to compete for. Mr. John Gibson, of the Hornsey Gas Company, was then elected Chairman of the Council. The Secretary will be pleased to hear from Gas Companies' Cricket Clubs, if they will communicate with him at No. 639, High Road, Tottenham.

Professor Henry Adams, M.Inst.C.E., whose works have been noticed from time to time in our columns, has recently retired from the City of London College, where for 35 years he was head of the Engineering Department. He is, however, still continuing his practice as a Consulting Engineer at 60, Queen Victoria Street, E.C., where he has had offices for the last 25 years.

Great success attended the first annual smoking concert of the British Gaslight Company's Cricket Club at Hull; fully 200 members and friends assembling at the Queen's Hotel. The President (Mr. John Young, the Company's Engineer) occupied the chair, and was supported by his Assistants, Mr. A. Dougall and Mr. H. Chamberlain, as well as by Mr. J. R. Warren, the District Superintendent, Mr. Lovatt, the Chief Clerk, and several other members of the staff. After presenting the prizes, the Chairman proposed success to the Club, and remarked that they had had a most successful first season. The Secretary (Mr. C. W. Appelbee) made a suitable reply, and proposed "The Health of the Chairman," which was very heartily received by all those present.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 607.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
530,000	10	Oct. 13	10½	Alliance & Dublin 10 p.c.	20⅜—21½	..	4 17 8
100,000	10	,,	7½	Do. 7 p.c.	13—14	..	5 7 2
220,000	5	Nov. 11	6½	Bombay, Ltd.. . . .	6—6⅝*	..	5 0 0
140,000	5	,,	6½	Do. New, £4 paid	4⅜—5*	..	5 4 0
50,000	10	Aug. 31	14	Bourne-) 10 p.c. . .	29—30	..	4 13 4
251,810	10	,,	7	mouth Gas) B 7 p.c. .	15⅜—16½	+⅛	4 4 10
53,200	10	,,	6	and Water) Pref. 6 p.c.	14½—15⅜	..	3 17 5
380,000	Stk.	Aug. 12	12	Brentford Consolidated	237-242	+2	4 19 2
300,000	,,	,,	9	Do. New . . .	180—185	+2	4 17 3
50,000	,,	,,	5	Do. 5 p.c. Pref. .	125—130	..	3 16 11
206,250	,,	June 10	4	Do. 4 p.c. Deb. .	104—107	..	3 14 9
220,000	Stk.	Sept. 15	11	Brighton & Hove Orig.	212—217	+3	5 1 5
246,320	,,	,,	8	Do. A. Ord. Stk. .	150—155	..	5 3 3
460,000	20	Sept. 29	10	British	39⅜-40⅜	..	4 18 9
100,000	Stk.	Aug. 12	6	Bromley, Ord. 5 p.c. .	115—120	..	5 0 0
165,700	,,	,,	4½	Do. do. 3½ p.c. .	90—95	..	4 14 9
500,000	10	Oct. 13	7	Buenos Ayres (New) Ltd.	11¼—11⅝	..	5 19 2
250,000	Stk.	June 29	4	Do. 4 p.c. Deb. .	93—95	..	4 4 3
150,000	20	July 14	8½	Cagliari, Ltd.	22—24	..	6 17 6
100,000	10	Sept. 29	10	Cape Town & Dis, Ltd.	14¼—14⅝	..	6 15 7
100,000	10	Oct. 27	4½	Do. 4½ p c Pref. .	9—9⅜	..	4 14 9
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	51—53	..	5 13 2
50,000	Stk.	June 29	4½	Do. 4½ p.c. Deb. Stk	98—100	..	4 10 0
1,375,000	Stk.	Aug. 31	5⅓	Commercial 4 p c Stk. .	109—111	..	4 13 9
560,000	,,	,,	5	Do. 3½ p.c. do. .	105—107	..	4 13 6
450,000	,,	June 10	3	Do. 3 p.c. Deb. Stk.	86—88	..	3 8 2
800,000	Stk.	June 10	6½†	Continental Union, Ltd.	105—106	..	6 2 8
200,000	,,	,,	7	Do. 7 p c. Pref.	135—140	..	5 0 0
486,090	10	July 14	11	European, Ltd. . . .	19⅛—20¼	..	5 7 4
354,060	10	,,	11	Do. £7 10s. paid	14—15	..	5 10 0
15,243,200	Stk.	Aug. 12	4⅛	Gas-) 4 p.c. Ord. . .	93—95	−½	4 12 7
2,600,000	,,	,,	3½	light) 3½ p.c. max. .	89—91	..	3 16 11
3,799,735	,,	,,	4	and) 4 p.c. Con. Pref.	107—109	..	3 13 5
4,193,975	,,	June 29	3	Coke) 3 p.c. Con. Deb.	87—89	..	3 7 5
258,740	Stk.	Sept. 15	5	Hastings & St. L. 3½ p.c.	90—95	..	5 5 3
70,000	10	Sept. 29	11	Hongkong & China, Ltd.	15—16	..	6 17 6
3,800,000	Stk.	Nov. 11	10	Imperial Continental .	206—208*	..	4 16 2
473,600	Stk.	Aug. 12	3½	Do. 3½ p.c. Deb. Red.	96—98	..	3 11 4
175,036	Stk.	Aug. 31	6	Lea Bridge Ord. 5 p.c. .	115—120	..	5 0 0
561,000	Stk.	Aug. 31	10	Liverpool United A . .	218—220	..	4 10 11
718,100	,,	,,	7	Do. do. B . .	159—161	..	4 6 11
366,083	,,	June 29	4	Do. do. Deb. Stk.	107—109	..	3 13 5
£			p.c.				£ s. d.
75,000	5	June 29	5	Malta & Medn., Ltd. .	4¼—4⅜	..	5 5 3
560,000	100	Oct. 1	5	Met. of) 5 p.c. Deb..	102—104	..	4 16 2
250,000	100	,,	4½	Melbourne) 4½ p.c. Deb.	100—102	..	4 8 3
541,920	20	Nov. 11	3½	Monte Video, Ltd. . .	10—11*	..	6 7 3
1,515,892	Stk.	July 29	4½	Newc'tle & G'tesh'd Con.	107—103	..	4 3 4
406,125	Stk.	July 1	3½	Do. 3½ p.c. Deb.	92—92½	..	3 15 8
15,000	10	Aug. 31	10	North Middlesex 10 p.c.	19—20	..	5 0 0
52,940	1/	,,	7	Do. 7 p.c.	13—14	..	5 0 0
300,000	Stk.	May 12	8	Oriental, Ltd. . . .	145—150	..	5 6 8
600,000	5	Sept. 15	7	Ottoman, Ltd. . . .	5⅜—6½	..	5 12 0
235,005	Stk.	—	6½	Plym'th & St'house 5 p.c.	—	..	—
398,490	5	Apl. 28	5	Primitiva Ord. . . .	5⅛—5⅜	..	4 6 11
796,980	5	July 28	5	Do. 5 p.c. Pref. .	4⅜—5	..	5 0 0
488,900	100	June 1	4	Do. 4 p.c. Deb. .	93—95	..	4 4 3
851,070	10	Oct. 13	7	River Plate Ord. . . .	11⅛—11⅜	..	5 16 8
300,000	Stk.	June 29	4	Do. 4 p.c. Deb. .	94—96	..	4 3 4
250,000	10	Sept. 15	6	San Paulo, Ltd. . . .	12—13	..	4 12 4
70,000	50	June 29	5	Do. 5 p.c. Deb. .	51—53	..	4 14 4
135,700	Stk.	Sept. 15	10	Sheffield A	237—239	..	4 3 8
209,984	,,	,,	10	Do. B	235—238	..	4 4 0
523,498	,,	,,	10	Do. C	236—238	..	4 4 0
123,998	Stk.	Sept. 29	5	Shrewsbury Ord. 5 p.c.	104½—107½	..	4 13 0
70,000	10	,,	11	South African	16—17	..	6 9 5
6,257,000	Stk.	Aug. 12	5½	South Met., 4 p.c. Ord.	127—129	..	4 5 3
1,832,700	,,	July 14	3	Do. 3 p.c. Deb.	88—90	..	3 6 8
575,000	Stk.	Aug. 31	5½	S'th Suburb'n Ord. 5 p.c.	118—123	..	4 9 5
60,000	,,	,,	5	Do. 5 p.c. Pref. .	120—125	..	4 0 0
112,533	,,	July 14	5	Do. 5 p c. Deb. Stk.	133—138	..	3 12 6
380,940	Stk.	Nov. 11	5	Southampton Ord. . .	103—107*	..	4 13 6
87,950	,,	—	4	Do. 4 p.c. Deb.	—	..	—
120,000	Stk.	Aug. 31	6¾	Tottenham) A 5 p.c. .	120—125	..	5 0 0
325,520	,,	,,	4½	and) B 3½ p.c. .	97—102	..	4 13 2
115,000	,,	June 29	4	Edmonton) 4 p.c. Deb.	104—107	..	3 14 9
182,380	10	June 10	8	Tuscan, Ltd.	8⅛—8⅝	..	9 2 10
149,900	10	July 1	5	Do. 5 p c. Deb. Red.	96—98	..	5 2 0
30,000	Stk.	Aug. 31	7½	Wands-) A 5 p.c. . .	150—155	..	5 0 0
255,636	,,	,,	6¾	worth) B 3½ p.c. . .	120—125	..	5 0 0
50,000	,,	,,	5⅞	and) C 3½ p.c. . .	102—107	..	4 18 2
59,416	,,	June 29	3	Putney) 3 p.c. Deb. Stk.	78—83	..	3 12 8
743,872	,,	Aug. 12	5	West Ham 5 p.c. Ord. .	98—100	+1	5 0 0
85,000	,,	,,	5	Do. 5 p.c. Pref. . .	117—122	..	4 2 0
160,000	,,	June 29	4	Do. 4 p.c. Deb. Stk.	103—108	..	3 14 1

Prices marked * are Ex div. † Next dividend will be at this rate.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

WATER ENGINEER (RESIDENT). Sheffield Water Department. Applications by Nov. 28.
MANAGER (AMERICA). No. 4287.
ESTIMATING AND DESIGNING ENGINEER. No. 4296.
MAINTENANCE DEPARTMENT. No. 4292.
ENGINE AND EXHAUSTER MAN. No. 4297.
STOKER. Horncastle Gas-Works.
JUNIOR CLERK. No. 4298.
FITTERS. Richmond Gas Stove and Meter Company.

Situations Wanted.

GAS FITTER. Dixon, Westminster.

Apprentice Wanted.

GILBERT LITTLE AND SONS, Smethwick.

Plant for Sale.

PUMPING ENGINE AND WELL PUMP. Birmingham Water Department.
GAS VALVES. Ripon Gas-Works.
GASHOLDER, PURIFYING TANK, CONDENSERS, &c. Brackett and Sons, Tunbridge Wells.
100-LIGHT WET METER. Leek Gas-Works.

Purifying Water from Sulphate Still. Particulars Required. No. 4295.

Manufacturing Firm to Take up Patent. No. 4265.

Mortgage Bonds. South Shields Gas Company.

Stocks and Shares.

BROMLEY GAS COMPANY. Dec. 7.
SOUTH ESSEX WATER COMPANY. Dec. 5.
WANDSWORTH AND PUTNEY GAS COMPANY. Nov. 29.

TENDERS FOR

Fire-Clay Goods.

ACCRINGTON GAS DEPARTMENT. Tenders by Dec. 7.

Gasholder.

CANNOCK, HEDNESFORD, AND DISTRICT GAS COMPANY. Tenders by Dec. 12.

Oxide of Iron (Spent).

BIRKENHEAD GAS DEPARTMENT. Tenders by Dec. 1.

Pipes.

LEICESTER GAS DEPARTMENT. Tenders by Nov. 30.

Purifying Plant.

EDINBURGH AND LEITH CORPORATION'S GAS COMMISSIONERS. Tenders for Dec. 12.

Tar and Ammoniacal Liquor.

BRIDGEWATER COLLIERIES COKE WORKS. Tenders by Dec. 19.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

United Kingdom: One Year, 21s.; Half Year, 10s. 6d.; Quarter, 6s. 6d.
Payable in Advance. If credit is taken, the charge is 25s. a year.
Abroad (in the Postal Union): £1 7s. 6d., payable in Advance.

All Communications, Remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.
Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

OXIDE OF IRON.

O'NEILL'S OXIDE has a larger annual sale than all other Oxides combined.

SPENT OXIDE purchased in any district.

GAS PURIFICATION & CHEMICAL CO., LD.

JOHN WM. O'NEILL, Managing Director,

PALMERSTON HOUSE, LONDON, E.C.

WINKELMANN'S

"VOLCANIC" FIRE CEMENT.

Resists 4500° Fahr. Best for GAS-WORKS.

ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

SULPHURIC ACID for Sale, specially suitable for making Sulphate of Ammonia.

BROTHERTON AND CO., LTD., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.

Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Exchanged for Spent Oxide.

READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

GAS TAR wanted.

BROTHERTON AND CO., LTD., Tar Distillers. Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, AND WAKEFIELD.

COAL GAS TAR wanted.

BEST PRICES GIVEN.

SHARPNESS CHEMICAL COMPANY, LIMITED, Sharpness Docks, GLOS.

AMMONIACAL LIQUOR wanted.

BROTHERTON AND CO., LTD., Ammonia Distillers. Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, AND WAKEFIELD.

BROTHERTON & CO., LIMITED.

Offices: Commercial Buildings, LEEDS. Correspondence invited.

GAS EXHIBITION. Comfortable Homelike Hotel (not licensed), Central. Will Managers and Secretaries send for Tariff? Mrs. GARRARD, 53, Hunter St., BRUNSWICK SQUARE, W.C.

PATENTS AND TRADE MARKS

PUBLICATIONS. "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; SUBJECT-MATTER of PATENTS," 6d.

MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 and 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

SULPHATE OF AMMONIA

SATURATORS and all LEAD and TIMBER WORK in Connection with Sulphate Plants.

We guarantee promptness, with efficiency for Repairs.

See our exhibit at the International Gas Exhibition, Earl's Court, Nov. 19 to Dec. 17.

JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON.

Telegrams: SATURATORS, BOLTON. Telephone 0848.

PENNY-IN-THE-SLOT WORK.

H. GREENE & SONS, Ltd., are pre- pared to give QUOTATIONS to Gas Companies or Corporations for FITTING UP COMPLETE and CARRYING OUT the WORK in its entirety, either in Iron or Compo.

SURREY ENGINEERING WORKS, BLACKFRIARS ROAD, LONDON, S.E.

Telephone: 1693 HOP. Telegrams: "LUMINOSITY."

SPENT OXIDE.

THE South Metropolitan Gas Company are always open to receive OFFERS of SPENT OXIDE.

Chief Office: 709, Old Kent Road, London, S.E.
Telegrams: "METROGAS, LONDON."

GAS and Water Works Supplies and Construction Company, Limited, Constructors for all Gas and Water Work and Main Laying. All Gas and Water Works Plant and Fittings supplied. Gas and Water Works Financed. Shares and Stock accepted in part payment for Work and Materials supplied. Gas and Water Works Shares and Stock Underwritten and Issued.

LONDON OFFICE, 99, CANNON STREET, E.C.

APPLICANTS for the position of DISTRICT INSPECTOR in a large Suburban Gas Company, advertised under No. 4276, are THANKED and informed that the post HAS BEEN FILLED.

YOUNG Man (Age 28) requires Situation as Incandescent Fitter. Maintenance or Street Lighting. Town or Country. First class references.—Address, G. DIXON, 99, York Street, Westminster, London, S.W.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, LONDON, S.E.

WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS, AND GOVERNORS.

REPAIRS RECEIVE PROMPT ATTENTION.

Telephones: 254 Oldham, and 2412 HOP, London.
Telegrams:—
"BRADDOCK, OLDHAM," and "METRIQUE, LONDON."

DUTCH OXIDE OF IRON.

THE First Dutch Bog Ore Co., Ltd., (Eerste Hollandsche Yzererts Maaty), ROTTERDAM.

General Manager (for England and Wales)—
CHARLES E. FRY, LEAMINGTON; and at Tower Chambers, Brown Street, MANCHESTER.

London Managers—
E. PADFIELD & CO., 96-98, Leadenhall Street, LONDON, E.C.

General Manager (for Scotland)—
J. B. MACDERMOTT, 11, Bothwell St., GLASGOW.

ANYONE able to supply details of a COMMERCIALLY SUCCESSFUL method for purifying the Waste Gas Water from a Sulphate Still will find it to his advantage to communicate with No. 4295, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by a Gas Company near London, a Junior Clerk, with some experience of Gas-Works routine.

Apply, with *copies* of References, stating Salary required, to No. 4238, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS STOKER wanted at once. Must be a good SHOVEL-CHARGER, and accustomed to Regenerative Settings. None but thoroughly reliable and sober men need apply.

Applications, stating Age, Height, and Wages required, with References, to the MANAGER, Gas-Works, HORNCASTLE.

ESTIMATING and Designing Engineer wanted by a Midland Firm, to TAKE CHARGE of Estimating Department. Used to Gasholders and Gas Work, Tanks, Girders, and Structural Steel Work.

Apply, by letter, stating Qualifications, Age, Salary, and when at liberty, to No. 4296, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Man thoroughly Expe- rienced in the Use and Management of Inclined Retorts, Cyanogen and Naphthalene Extraction Processes, &c., to Take Charge of Works in America. Good position to right party. Man must be active and energetic.

Address, stating Age, Experience, References, and Salary expected, to No. 4287, care of Mr. King, 11, Bolt Court, Fleet Street, LONDON, E.C.

WANTED, by a Suburban Gas Com- pany, an energetic Man to undertake Maintenance of Incandescent Burners, to visit Consumers, and advise as to the best methods of using gas.

Applicants must be Experienced in all Modern Types of Incandescent Burners, Cooking and Heating Stoves, Gas-Engines, &c., and also capable of preparing estimates for fitting up Gas Installations.

Applications, stating Age, Experience, and Wages required, accompanied by *copies* of Two recent Testimonials, to be sent to No. 4292, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

CITY OF SHEFFIELD.

DERWENT VALLEY WATER ACT, 1899.

THE Corporation of Sheffield invite APPLICATIONS from competent Engineers for the Appointment of RESIDENT ENGINEER in the construction of a Tunnel for the purpose of conveying water from the Works of the Derwent Valley Water Board at Ladybower to the Works of the Sheffield Corporation in the Rivelin Valley, a total length of nearly Five Miles, of which a length of about 1700 yards has already been driven.

The gentleman appointed will be required to reside in the immediate vicinity of the Tunnel works, and to devote the whole of his time to his duties under the Corporation. He will have daily personal charge of the work, and be responsible for it throughout; and will perform all special work and duties in connection therewith which the Water Committee of the Corporation may desire. The staff of Assistants, Inspectors, and others is provided by the Corporation, and will be under the direction of the Engineer.

The Engineer will be required to confer with the Consulting Engineer with regard to all plans and designs, and at every step during the progress of the works, but without thereby lessening his own absolute responsibility; and he shall report direct to the Water Committee, from whom alone he will take instructions.

It is indispensable that candidates for the appointment should have had considerable experience both in the design and carrying out of similar works, either under a contractor or by administration under a public authority.

Applicants must state Age, Experience, present Position, Salary required, when at Liberty, and forward *copies* of Testimonials, and the names of Two References. Personal canvassing will be a disqualification.

Applications to be sent to me not later than Monday, the 28th day of November inst., endorsed "Rivelin Tunnel Engineer."

By order,
HENRY SAYER,
Town Clerk.

Town Hall, Sheffield, Nov. 9, 1904.

OXIDE OF IRON.
(NATURAL.)

BALE & CHURCH will be pleased to send Samples and Quotations, and make Offers for SPENT OXIDE.

BALE'S FIRE CEMENT, PAINT, AND GAS COAL,
5, CROOKED LANE, LONDON, E.C.

SULPHURIC ACID.

SPECIALLY prepared for the Manu- facture of SULPHATE OF AMMONIA.

SPENCER, CHAPMAN, AND MESSEL, LIMITED, 86, Mark Lane, LONDON, E.C. Works: SILVERTOWN.

Telegrams: "HYDROCHLORIC, LONDON."
Telephone: 341 AVENUE.

AMMONIACAL Liquor wanted by JOHN RILEY & SONS, Hapton, near ACCRINGTON.

THE KEITH LIGHT.

OVER 1600 INSTALLATIONS IN DAILY USE.

SEE illustrated advertisement in next week's issue.

JAMES KEITH AND BLACKMAN, Co, LTD., 27, Farringdon Avenue, LONDON, E.C.

"NUGEPE" CEMENT.

JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS,
MANCHESTER.

For all Joints in connection with Oil-Gas Plant and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

WANTED, a Steady and Reliable Man, used to Engines and Exhausters and the working of Gasholder Valves.

Apply, by letter, with References, to No. 4297, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS Fitters—Wanted, First-Class Men with undeniable References for Barrel and Compo. Immediate employment.

Apply to THE RICHMOND GAS STOVE AND METER COMPANY, LIMITED, Stratford, ESSEX.

GILBERT LITTLE AND SONS, LIMITED, SMETHWICK.

ANY Gentleman who has a son, a skilled trained Engineer, or a son whom he wishes (during his apprenticeship) to be trained in all the departments—viz., the Drawing-Office, Pattern Shop, Turning Shop, Fitting Bench, and outside Erecting Work—is invited to communicate with the above.

WANTED, a firm of Good Repute to undertake the MANUFACTURE and SALE of New Patented Apparatus for making Gas. Good profits yielded. The English Patents will eventually BE SOLD to a firm having suitable machinery for the manufacture of the apparatus.

Address No. 4265, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE—A 100-Light Wet Meter Just Overhauled. Splendid Condition. Delivered free.

Best Offers to A. BOTTELEY, Gas-Works, LEEK.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.

J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

NEW Gasholder, 40 ft. diameter by 12 ft. deep, with Steel Standards; also new STEEL TANK to contain same.

Write J. WRIGHT, 181, Queen Victoria Street, LONDON, E.C.

"DEMPSTER'S" Direct-Acting Re- ciprocating Pumps, Exhausters, and Steam-Engine Combined. Two Sets, 8-inch and 12-inch Connections. Overhauled and Guaranteed. Cheap. Room wanted.

FIRTH BLAKELEY & Co., Gas Engineers, DEWSBURY.

CITY OF RIPON GAS-WORKS.

GAS VALVES FOR SALE.—One 10- inch, five 8-inch, one 12-inch. All in good condition and gas tight.

Apply, W. T. LANCASTER, Manager, Gas-Works, Ripon.

GAS-MAKING PLANT, including Iron GASHOLDER (18 feet diameter), PURIFYING TANKS, and Condensers; also valuable CONSERVATORIES and GREENHOUSES, and a Hot-Air ENGINE and PUMP, TO BE SOLD in the Gardens at South Park, Wadhurst, Sussex, on Tuesday, the 6th of December, at Two o'clock.

Catalogues of the Auctioneers, Messrs. BRACKETT AND SONS, Tunbridge Wells, and 34, Craven Street, CHARING CROSS, W.C.

ROBERT DEMPSTER & SONS, Ltd., Contractors for Complete CARBONIZING PLANTS and every description of GAS APPARATUS and ELEVATING and CONVEYING PLANT, ROSE MOUNT IRON-WORKS, ELLAND.

WATER-Works Pumping Engine for Sale. Modern Compound Surface Condensing PUMPING ENGINE and WELL PUMPS, for a depth of 200 feet. Engine Cylinders 25 in. and 54 in., by 5 ft. Stroke, Pump 24-inches diameter. Steel Rising Main, with Lowering Rods and Screws.

Further Particulars and order to view to be obtained from the SECRETARY, Corporation Water Offices, BIRMINGHAM.

CANNOCK, HEDNESFORD, AND DISTRICT GAS COMPANY, LIMITED.

GASHOLDER.

THE Directors of the above Company are prepared to receive Tenders for a "Gadd and Mason" GASHOLDER, to be erected at these Works.

Specification may be obtained upon application to the undersigned on payment of Two Guineas, which will be returned on receipt of a *bona-fide* Tender.

Sealed Tenders, endorsed "Tender for Gasholder," must be delivered on or before Dec. 12, 1904.

The Directors do not bind themselves to accept the lowest or any Tender.

T. A. NICHOLLS,
Secretary.

Gas-Works, Cannock,
Nov. 18, 1904.

TO CHEMICAL MANUFACTURERS.

THE Corporation of Birkenhead are prepared to receive TENDERS for the Purchase and Removal of about 200 tons of SPENT OXIDE OF IRON, now lying at the Gas-Works.

Forms of Tender and Samples may be obtained from Mr. T. O. Paterson, Gas Engineer, Gas-Works, Thomas Street.

Tenders, sealed and endorsed "Tender for Spent Oxide of Iron," to be sent in to me not later than Five p.m., on Thursday, December 1, 1904.

The Corporation do not bind themselves to accept the highest or any Tender.

By order,
ALFRED GILL,
Town Clerk.

Town Hall, Birkenhead, Nov. 17, 1904.

CORPORATION OF LEICESTER.

CAST-IRON PIPES.

THE Gas and Electric Lighting Com- mittee of the above Corporation are prepared to receive TENDERS for the supply and delivery of the necessary Cast-Iron PIPES and CONNECTIONS, from 2 to 36 inches in diameter, required during the Twelve Months ending December 31, 1905.

Specification and Form of Tender may be obtained upon application to the Engineer.

Tenders, addressed to Mr. Councillor Edwards, Chairman, and endorsed "Tender for Cast-Iron Pipes, &c." to be delivered at these Offices not later than Eleven o'clock a.m., on Wednesday, November 30, 1904.

The Committee do not bind themselves to accept the lowest or any Tender.

ALFRED COLSON, M.Inst.C.E., M.Inst.E.E.,
Engineer and Manager.

Offices: Millstone Lane,
Leicester, Nov. 18, 1904.

EDINBURGH AND LEITH CORPORATIONS' GAS COMMISSIONERS.

GRANTON GAS-WORKS.

TO IRON AND STEEL CONTRACTORS.

THE Commissioners are prepared to receive TENDERS for the Supply, Delivery, and Erection of (1st) PURIFYING PLANT HOUSE (Iron and Steel Structure) and (2nd) PURIFYING PLANT.

Specifications, Schedules of Quantities, and Forms of Tender may be obtained on application to Mr. W. R. Herring, M.Inst.C.E., Chief Engineer and Manager, on receipt of a Crossed Cheque for Five Guineas, which will be returned when a *bona-fide* Tender is received.

The Drawings may be inspected by appointment, and further information obtained upon application to the Engineer, New Street Works, Edinburgh.

Sealed Tenders must be addressed and delivered to the undersigned on or before 10 a.m. on the 12th day of December, 1904.

The Commissioners do not bind themselves to accept the lowest or any Offer.

JAMES M'G. JACK,
Clerk.

25, Waterloo Place, Edinburgh,
Nov. 18, 1904.

BROMLEY GAS CONSUMERS' COMPANY.

ISSUE OF THREE-AND-A-HALF PER CENT. DEBENTURE STOCK.

SALE BY TENDER.

THE Directors Invite Tenders for £8000, of Debenture Stock authorized to be raised under the Bromley Gas Acts, 1865, 1879, and 1902, which will bear a fixed and perpetual preferential rate of Interest of £3 10s. per cent. per annum, payable Half-Yearly (subject to Income-Tax). Allotments to the Highest Bidders.

Tenders must be delivered on or before Wednesday, the 7th day of December, 1904.

Forms of Tender, with Particulars and Conditions, may be obtained on application to the Secretary, at the Company's Offices, 156, High Street, Bromley, Kent, or from the Company's Bankers, Messrs. Robarts, Lubbock, and Co., 15, Lombard Street, London, E.C.

By order of the Directors,
HENRY WILLIAM AMOS,
Secretary.

Bromley, Kent, Nov. 18, 1904.

ACCRINGTON DISTRICT GAS AND WATER BOARD.

THIS Board is prepared to receive Tenders for FIRECLAY RETORTS and FIRE-BRICKS. Retorts: 32 20-feet long for Great Harwood Works, and 42 9 ft. 8 in. for Accrington Works. Fire Bricks: About 20,000.

Tenders, endorsed, to be in my hands on or before Wednesday, the 7th of December.

CHARLES HARRISON,
General Manager.

General Offices of the Board,
St. James' Street, Accrington, Nov. 19, 1904.

BRIDGEWATER COLLIERIES COKE WORKS.
(THE EARL OF ELLESMERE).

TENDERS are invited for the Tar pro- duced at the above Works for a period of Six or Twelve Months from the 1st of January, 1905, delivered into Contractor's Tanks at the Bridgewater Colliery siding, Warton Hall, on the Pendleton and Hindley branch of the Lancashire and Yorkshire Railway; or at the Brackley siding, Little Hulton Mineral branch of the London and North Western Railway.

The estimated quantity is 2500 Tons per annum.

Tenders, endorsed "Tender for Tar," to be addressed to Mr. Thomas M. Brown, Bridgewater Coal Offices, 4, Chapel Walks, Manchester, on or before the 19th of December.

Manchester, Nov. 19, 1904.

SOUTH SHIELDS GAS COMPANY.

ISSUE OF 3½ PER CENT. MORTGAGE BONDS.

THE Directors are prepared to receive APPLICATIONS for MORTGAGE BONDS at the above Rate, less Income-Tax, in multiples of £100, for a term of not less than Three Years, repayable at any time after that period by a Six Month's Notice on either side.

Interest payable Half-Yearly, on the 30th of June and 31st of December in each Year.

J. H. PENNEY,
Secretary.

Gas Offices, Chapter Row,
South Shields, September, 1904.

ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing such Capital, and also for including Gas and Water Stocks and Shares belonging to Private Owners in these Periodical Sales, can be obtained on application at MR. ALFRED RICHARDS' OFFICES 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
WANDSWORTH AND PUTNEY GASLIGHT AND COKE COMPANY.

NEW ISSUE OF £10,000 ORDINARY "C" STOCK, ranking for a Standard Dividend of 3½ per cent., subject to the Sliding-Scale, the last Dividend on the Company's existing "C" Stock having been at the rate of £5 8s. 6d. per cent. per annum.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION at the Mart, Tokenhouse Yard, E.C., on Tuesday, Nov. 29, at Two o'clock, in Lots of £100, £50, and £25 each.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
SOUTH ESSEX WATER-WORKS COMPANY.

NEW ISSUE OF £5000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK AND £5000 ORDINARY STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Monday, Dec. 5, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

STEAM, OIL, and WATER.

Any Range of Pressure.

Now Ready, Price 15s., Limp Cloth.

TWENTY-FOURTH YEAR.

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OF THE

METROPOLITAN WATER COMPANIES

(Chelsea, East London, Grand Junction, Kent, Lambeth, New River, Southwark and Vauxhall, and West Middlesex),

AND OF THE

ACCOUNTS OF SOME OF THE PRINCIPAL

PROVINCIAL WATER UNDERTAKINGS

FOR THE YEAR 1903-1904.

Compiled by

WOOD, DREW, & CO.,

Chartered Accountants.

LONDON:
WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

GREAT IMPROVEMENTS IN GAS-RETORTS.

Patented.

THIS invention applies to improvements in connection with Gas-Retorts, and is applicable to inclines or horizontal Retorts. The improvement applies particularly to the Catch Box on the Mouthpiece, which, as is well known, often gets damaged or broken off when in use, it usually being cast on the Mouthpiece. The consequence is that it necessitates the providing of an entirely New Mouthpiece, entailing great labour and cost of replacement.

Our Invention has for its object to provide an Adjustable Catch Box Clip, which we are enabled to adjust or substitute for the damaged part of the ear, which has been broken off. It is simple, economical, and very expeditiously applied, thus restoring the Retort to a workable condition. They can be applied in one hour, without letting the heats down.

These Catch Box Clips are in use, and have saved a great deal in labour and cost at the Gas-Works at Rochdale, Manchester, and Heywood.

There are four different Catch Box Clips for the Inclined Retorts, which are for right and left hand, but are different for the charging and drawing part.

Please say when ordering whether for Incline or Horizontal Retorts, and for which hand, and the Maker of the Mouthpiece.

The Price of these Catch Boxes is 10s. 6d. each, fitted up with Bolts and Pin or Centre Stud.

The Patentees are prepared to negotiate for the Sale of the Patent, or to grant Licences for its Manufacture.

For further Particulars, apply to

A. & E. HOLT,
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JAMES OAKES & CO.,

ALFRETON IRON-WORKS, DERBYSHIRE,

AND

Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts, and Covers, and rendering Leakage impossible.

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New and Second-Hand with all Accessories; also Tip Waggons and Turntables.

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Operated Entirely by One Handle
Class A lifts 24 ft.
Class B lifts 12 ft.
SEND FOR LIST.
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TRY OUR WELL-KNOWN
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PATENT RECUPERATIVE
INCANDESCENT GAS LAMP.
The only Lamp with absolutely **DUST AND INSECT PROOF BURNER.**
MANY DETAIL IMPROVEMENTS.
This Burner being positively Dust and Draught Proof, it prolongs the life of the Mantle and Saves its Cost in Maintenance.
See Testimonials.

SEE OUR EXHIBIT, STAND 41A, ANNEXE, GAS EXHIBITION.

THE POPULAR LAMP.
6.A. Fig. 6. Enamelled White Case and Flat Opal Reflector or Crimped Opal.

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Highest Results in Gas, & Excellent Coke.
QUOTATIONS ON APPLICATION TO
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Sperm Value 878·85 lbs. per Ton.
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And every description of Fire-Clay Goods.
RETORTS CAREFULLY PACKED FOR SHIPMENT.

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Largely adopted by many Local Authorities for Public Lighting, being absolutely Shadowless and Wind-proof.

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27½ to 30 Candles per cubic foot with our "S" type of Burners.

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Sources of Light from 80 to 500 Candles.

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APPLICABLE TO EVERY KIND OF PURIFIER.

This System is in successful operation at a very large number of important Gas-Works on the Continent, and orders have been received from English Engineers as follows:—

			ft.		ft.		ft.	in.
CHESTER	1	Purifier	24	×	22	×	5	3
CHESTER 2nd Order	1	,,	24	×	22	×	5	3
ROCHESTER	4	,,	20	×	20	×	5	6
ROCHESTER 2nd Order	2	,,	24	×	20	×	5	0
SOUTHEND	2	,,	20	×	15	×	4	6
HULL	2	,,	20	×	20	×	5	0
BRENTFORD	1	,,	20	×	30	×	7	0
WINCHESTER	4	,,	15	×	15	×	6	0
CAGLIARI	4	,,	10	×	10	×	4	0
HALSTEAD	4	,,	9	×	9	×	5	0
DEAL	1	,,	10	×	10	×	4	6
LEAMINGTON	1	,,	20	×	20	×	5	0
OLDHAM	4	,,	20	×	20	×	4	0

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See STAND No. 12 at the International Gas Exhibition.

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COMPRESSED AIR DRIVEN

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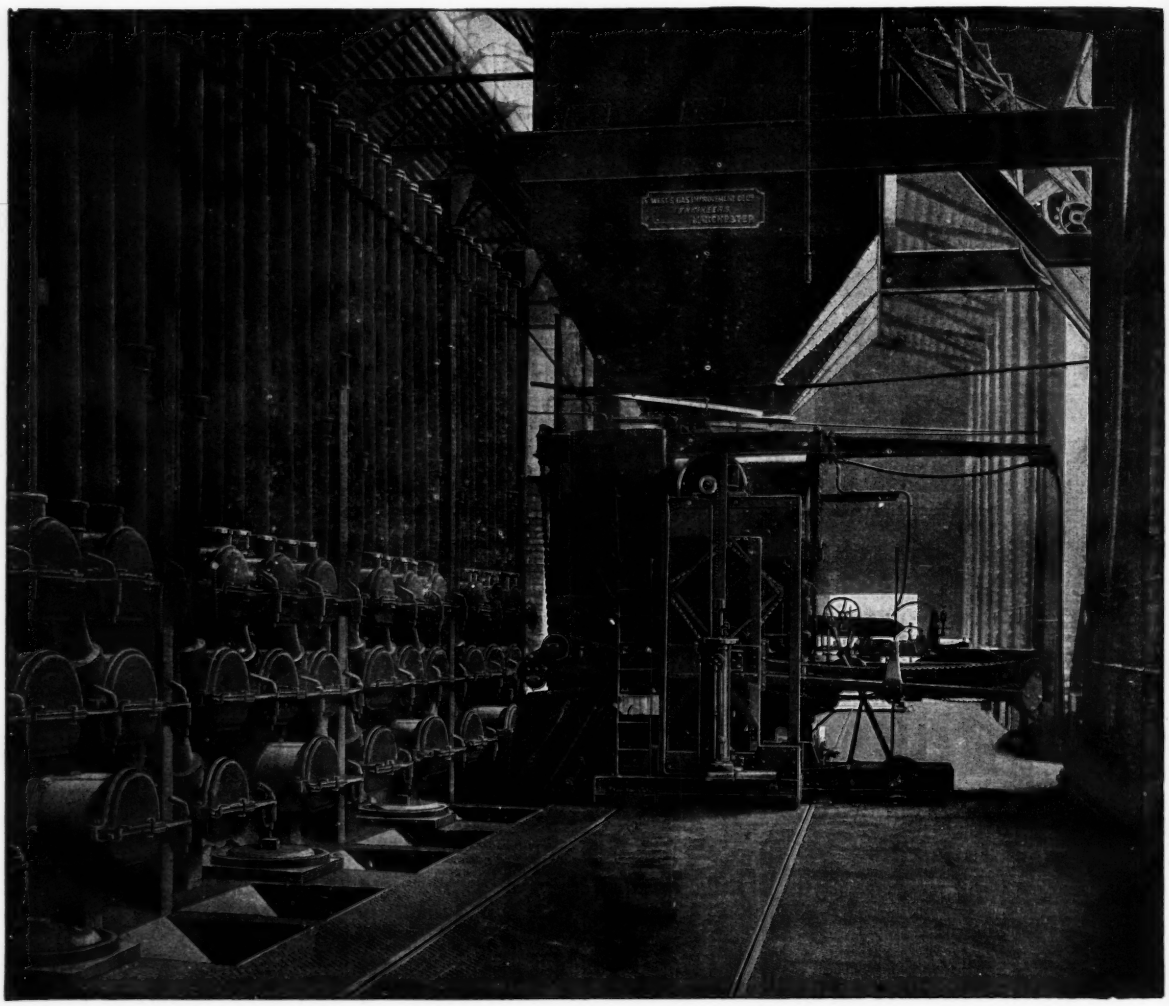
COMBINED CHARGING AND DRAWING MACHINES; also

MANUAL CHARGING AND DRAWING MACHINES.



West's compressed Air Driven Charging and Drawing Machine, requiring only One Machine driver and one attendant to charge and draw the Retorts, attend to the Mouthpieces, and fill the Furnaces.

All classes of Coal can be efficiently dealt with by the West's Charging Machines, and the Retorts are charged evenly throughout with the full weight of Coal.

Retort-Houses fitted with West's Regenerator Furnaces, Stoking Machinery, and Coke-Conveyors reduce the cost of Carbonizing Coal to a minimum.

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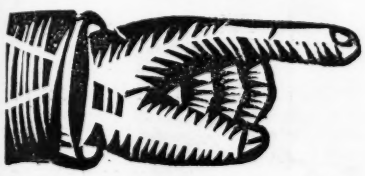

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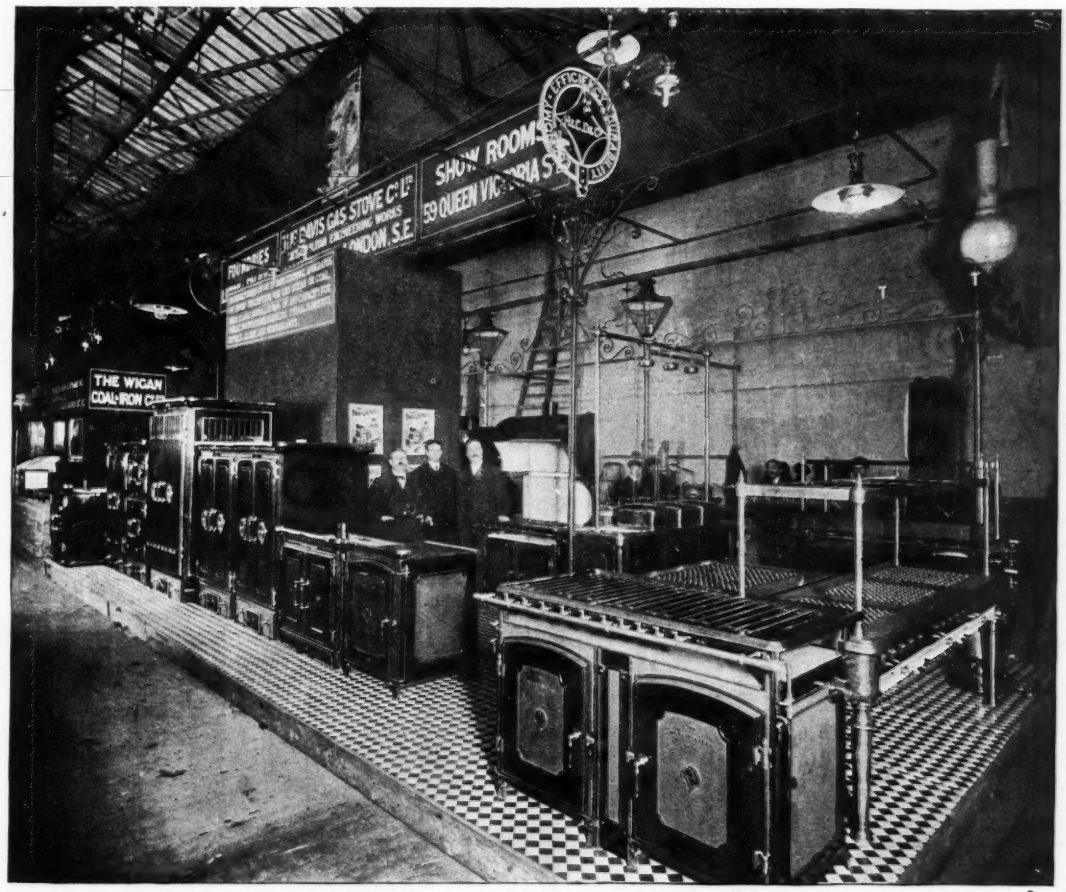

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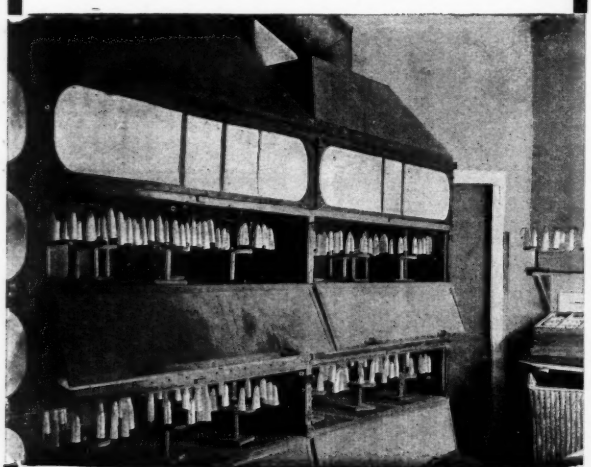

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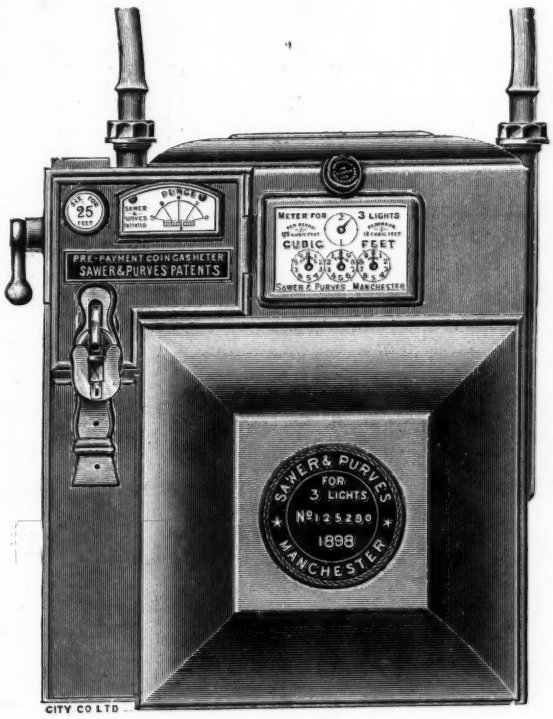
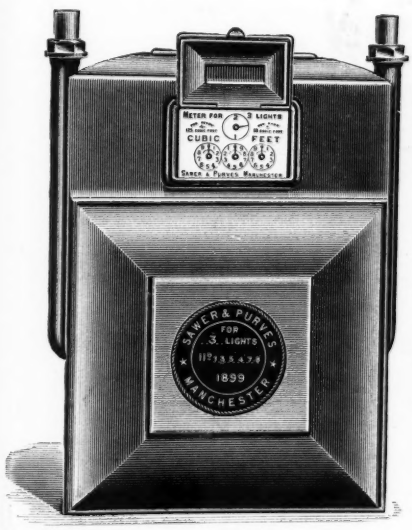


BUT GAS AUTHORITIES



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Scoops supplied with or without handles, and of any dimensions or shape required

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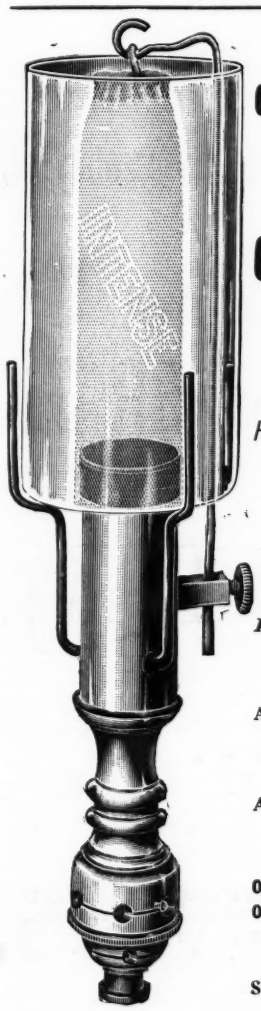

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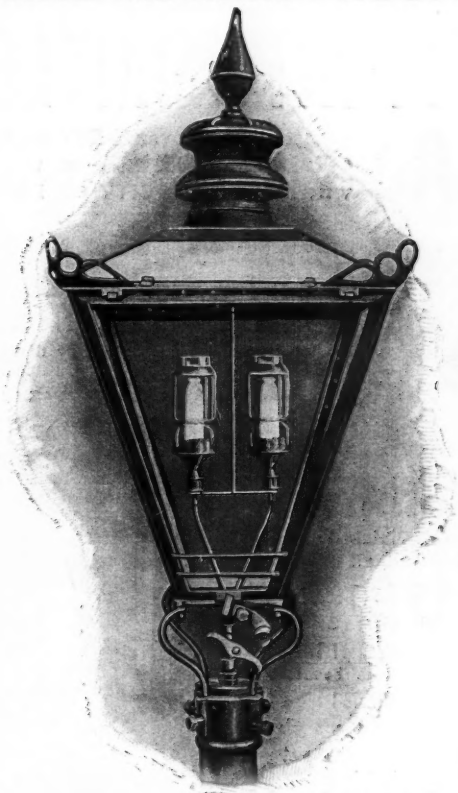
ALL COPPER.

WIND AND RAIN PROOF.



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Enamelled Earthenware Reflector,
"Bray" C. Burners and
Anti-Vibrating Frame.

These Lanterns are made in several Designs and Sizes.

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GAS LIGHTING ENGINEERS,
LEEDS.

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FOR GAS ENGINEERS & MANAGERS

(DEDICATED TO SIR GEORGE LIVESEY).

The Work has been revised throughout, and contains 40 pages of Letterpress and 12 Illustrations more than the last Edition.

In almost every department additions have been made; and it is believed that the labour bestowed on its production will enhance the value of the book as a Work of Reference.

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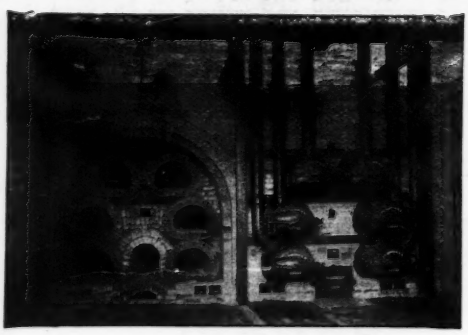

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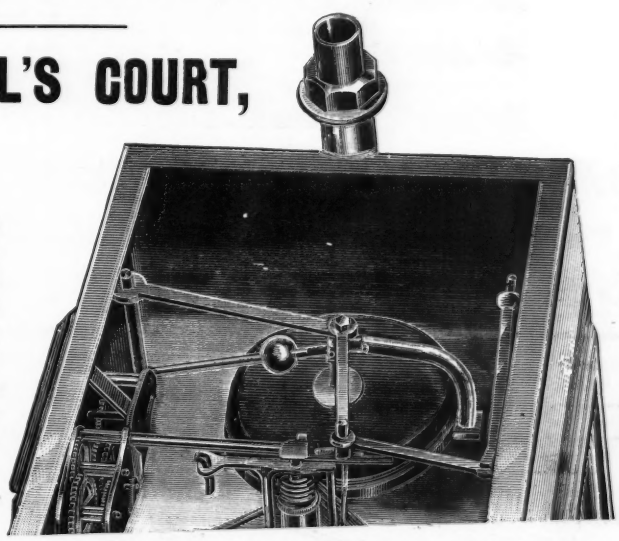

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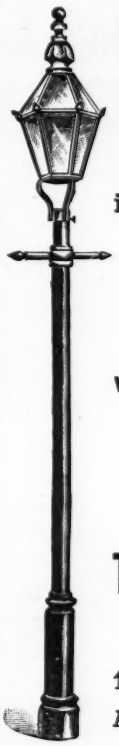

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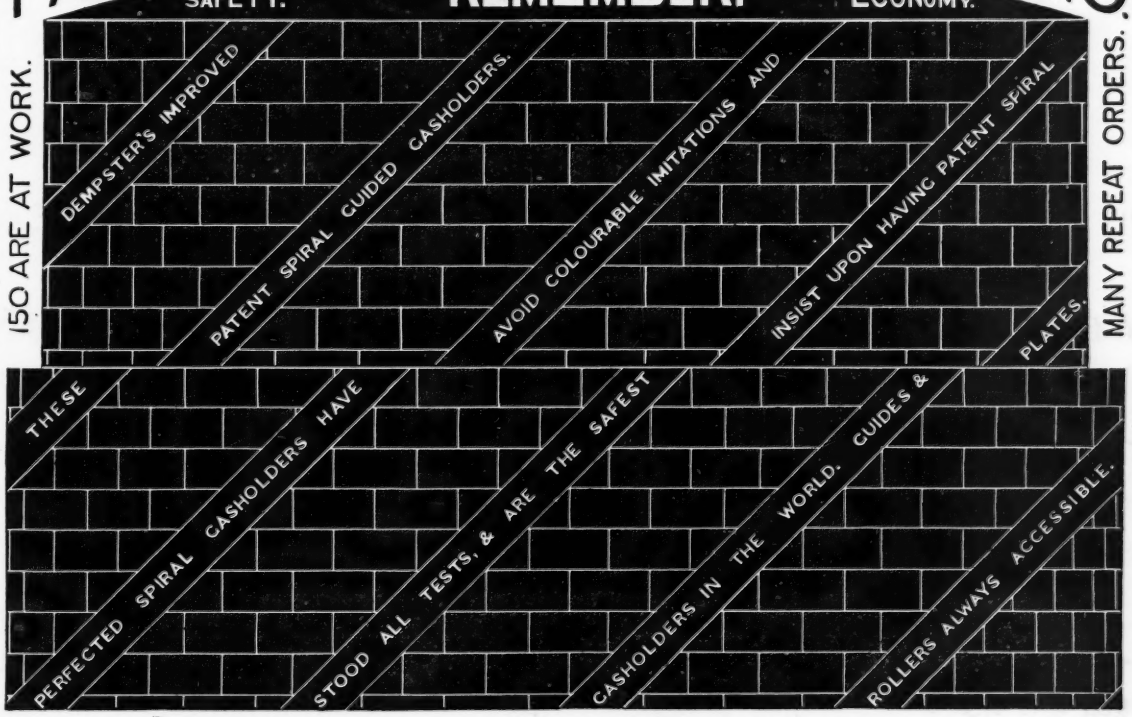

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[See also Advt. p. 425.

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